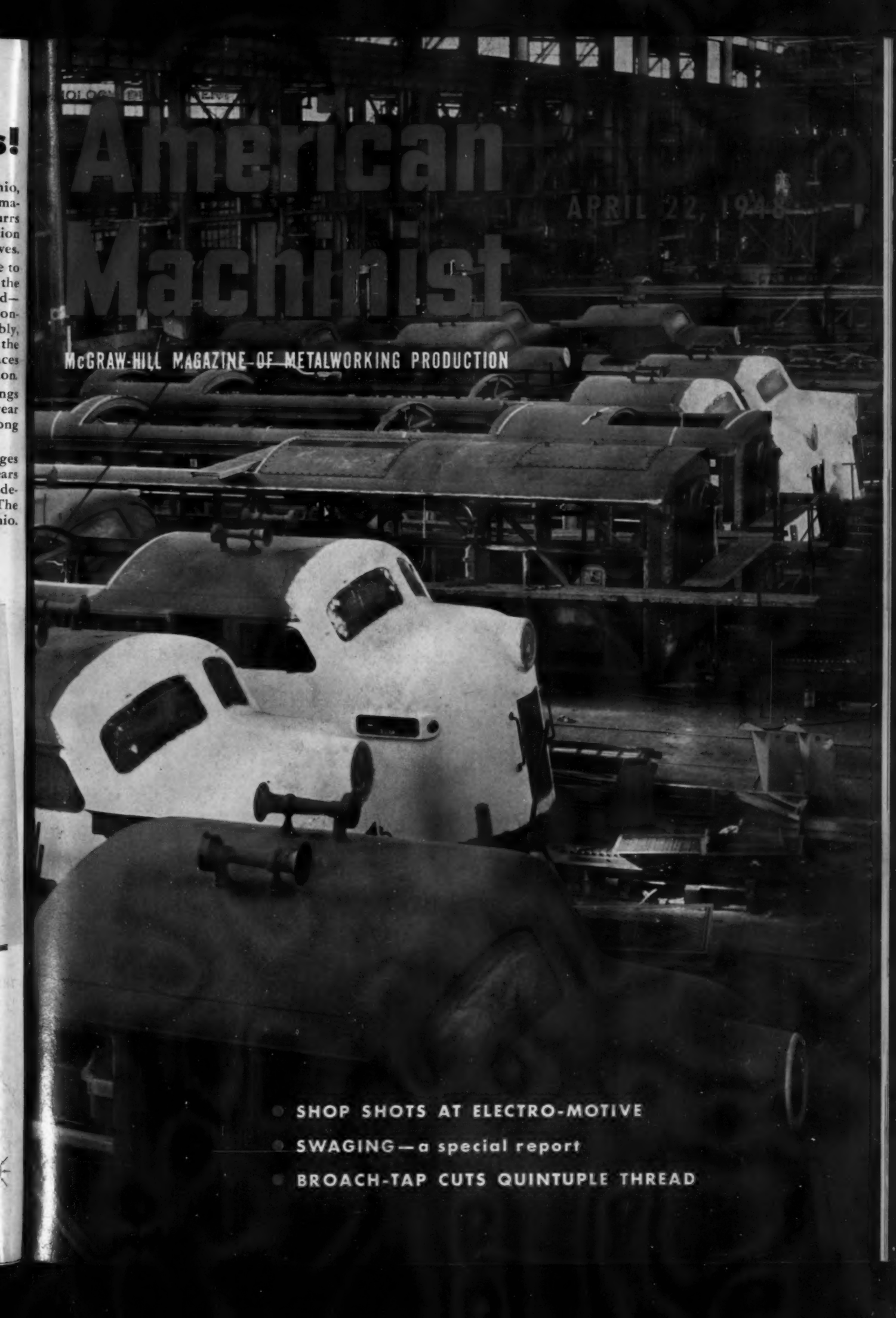
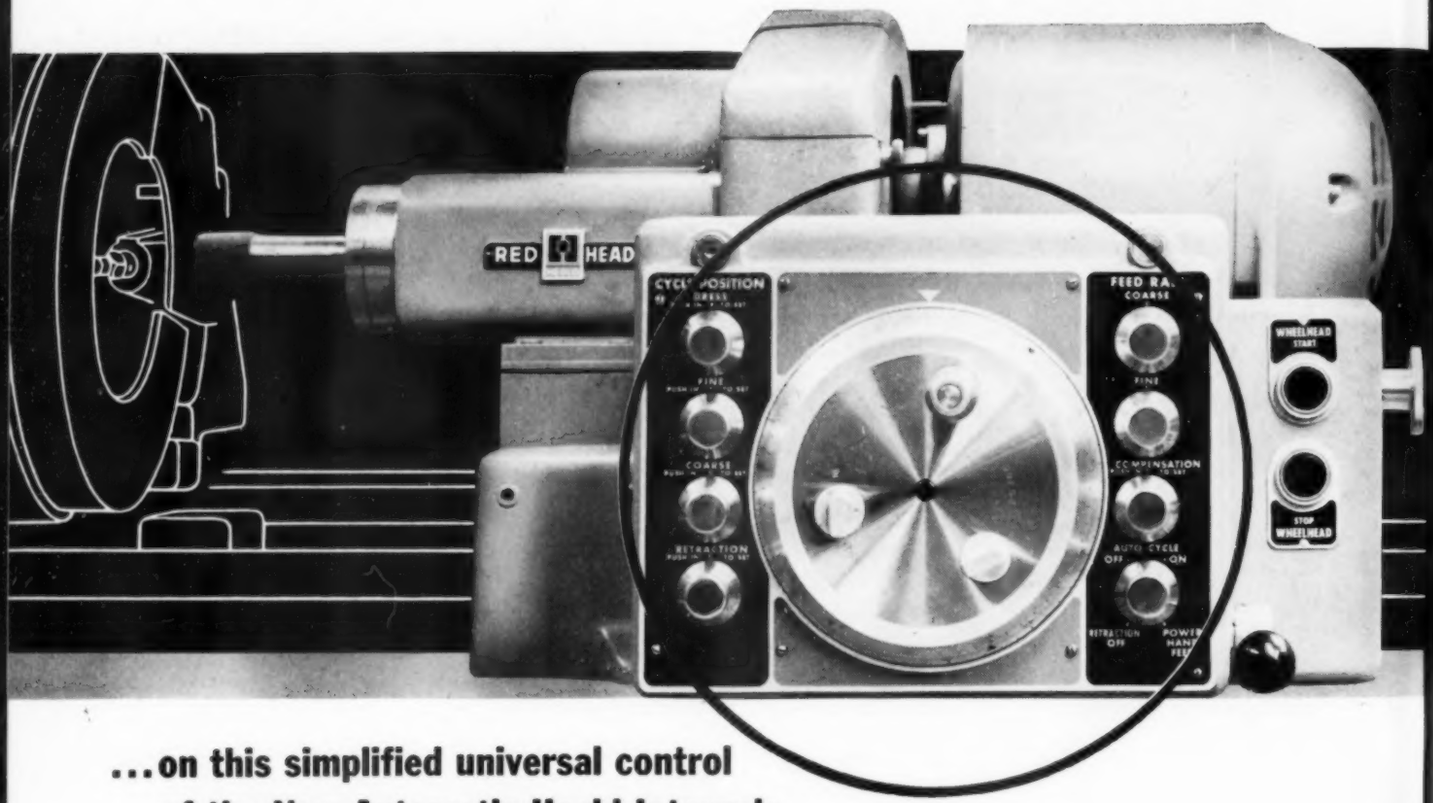

American
Machinist
APRIL 22, 1948
McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION
SHOP SHOTS AT ELECTRO-MOTIVE
SWAGING—a special report
BROACH-TAP CUTS QUINTUPLE THREAD

DIAL YOUR COMPLETE SET-UP AND SIZING METHOD



...on this simplified universal control of the New Automatic Heald Internals

HERE, at your finger tips, are the dials that accurately pre-set the operating cycle of the New Automatic Heald Internals—feed rates, table speed, and *sizing method*. With this unique universal feed control, either Size-Matic or Gage-Matic sizing can be quickly and easily set into the automatic machine cycle.

In the *Size-Matic* method, sizing is accurately controlled by truing the grinding wheel at a predetermined point within finish size, and then automatically feeding the wheelhead cross slide the additional amount needed to finish the work to the exact dimensions required. All operations are completely automatic, including wheel dressing and compensation for wheel wear.

In the *Gage-Matic* method, bore size is automatically measured by plug gages which check the bore at each reciprocation of the table. When work reaches finish size, the gage enters the hole and the table runs out to rest position. The wheel is dressed automatically during the machine cycle.

The development of this simplified universal control — a Feature of the new Heald Centerless Internal Grinders — writes another chapter in the history of Heald Automatic Sizing.

Heald Model 271 Internal Grinder, with universal-type feed control for wheelhead cross slide. This finger-tip control unit, shown in large illustration above, provides for quick set-ups with Automatic Sizing by either the Gage-Matic or Size-Matic method.

HEALD

THE HEALD MACHINE COMPANY, Worcester 6, Mass.

Branch Offices in Chicago • Cleveland • Dayton • Detroit • Indianapolis • Lansing • New York

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Member of the Associated Business Papers and the Audit Bureau of Circulations.

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Published every other Thursday. Price 35c per copy. Allow ten days for change of address. Subscription Rates: United States and possessions, $5 a year, $8 for two years, $10 for three years. Canada, $6 for one year, $10 for two years, $12 for three years. Pan-American countries, $10 for one year, $16 for two years, $20 for three years. All other countries, $20 a year, $30 for two years, $40 for three years. Please indicate position and company connection on all subscription orders. Entered as second-class matter, August 13, 1943, at Post Office, New York, N. Y., under the act of March 3, 1879. Printed in U.S.A. Return postage guaranteed.

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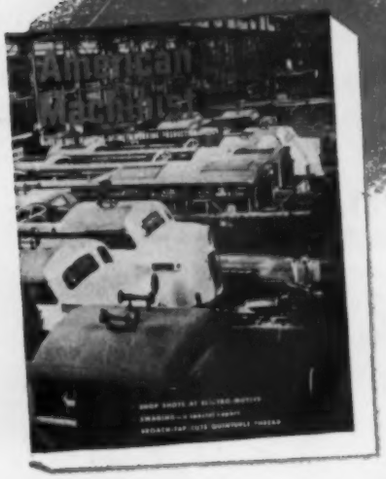
PUBLISHED BY McGRAW-HILL PUBLISHING COMPANY, INC.
330 West 42nd St., New York 18, N.Y.
Cables: "McGRAW-HILL, New York"

James H. McGraw, Jr., President; James H. McGraw (1860-1948), Founder; Curtis W. McGraw, Senior Vice-President and Treasurer; Nelson Bond, Director of Advertising; Eugene Duffield, Editorial Assistant to the President; Joseph A. Gerardi, Secretary; J. E. Blackburn, Director of Circulation.



Chips and QUIPS

Our Cover . . . Taken especially at our request, this general view of the locomotive assembly area at the 54-acre La Grange (Ill.) plant, Electro-Motive Division, General Motors, is a remarkable Kodachrome. Interior general views are difficult anyway because of mixed lighting and frequent haze, but this one is complicated by welding and other factors. It, however, puts the Shop Shots group in this issue into living color.

In this plant of the world's largest locomotive manufacturer, five diesel locomotives are assembled each working day, each consisting of some 17,000 parts. Today there are in service on American railroads more than 3,700 GM diesel-loco units built in this plant. They total almost 5 million hp., and power, among others, more than 150 famous name trains, including the *20th Century Limited* and *Super Chief*.

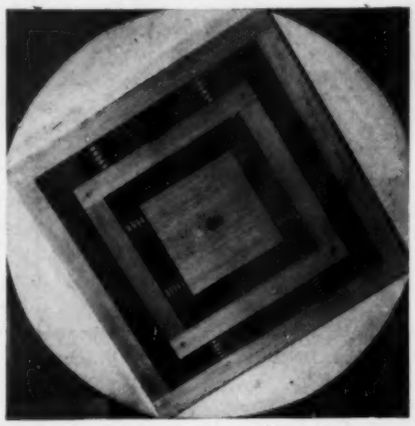
Broach-tap . . . Gardner-Denver had to tap a 1½-2 Acme quintuple thread in power feed nuts. Tap and broach makers both sensibly turned down the job. But G-D needed it, so developed a combined broach-tap that could be operated in a hydraulic broach. Harry Wharen gives you details herewith.

Confucian Technique . . . In addition to our Shop Shots from Electro-Motive, we have a spread of pictures showing how Keystone Brass Co., Erie, Pa., uses fixtures to aid work-handling in machining brass fittings . . . Another story, plentifully illustrated, describes automatic assembly of a hinge at Square D, now done at 47 times the hand assembly rate. Paul Bonness, supt. of the Industrial Controller Division, tells about it.

Rhymes With . . . The pitfalls of an editor are many, but wrong pronunciation is rarely one. However, Andy Ashburn stumbled over the word *swage* when he started work on the special report in this issue. He would arrive at a plant rhyming it with *page* only to have the local engineers, with a superior look, rhyme it with *ledge*. So at the next plant he would try *ledge*. You've guessed it —the local authorities favored *page*. The result of his research contains a lot of data on when and how to swage, but Andy refuses to give an opinion on how to pronounce the process.

Coming . . . Our May 6 *A.M.* special report takes up machining of copper and its alloys, thus rounding out our Feb. 26 report on finishing the same materials . . . Two articles describe important new developments: the damped quill which ends self-excited chatter in boring bars, and the method for plating magnesium . . . Lawrence Sagle describes the new locomotive-flue shop of the B. & O.; there are other articles on a tricky compound progressive die, on work handling, on a safety program that works . . . E. H. Girardot presents No. 6 in his interest-arousing series on punch presses; Dr. Haig Solakian part 3 on salt baths.

Ambidextrous . . . P. A. and A. D. Wood have registered the company name, "Left Hand, Ltd." at Birmingham, England. They will deal in "left-hand" machine tools, which operate counterclockwise, according to the *Associated Press*. Both men are right-handed.



SHOCK ABSOBER . . . Our Buenos Aires news man, in all seriousness, sent in this photo with the caption: "A wheel with its own suspension device to absorb shocks in driving has been invented by Cesar Martino. The inventor states his invention will eliminate necessity for shock-absorbing devices on the chassis body and contemplates making a trip to Detroit where he hopes to interest auto manufacturers with the innovation." Wanna bet?

To Our Subscribers

UNSETTLED RELATIONS between printers with whom we deal and certain of their employees have forced us to use some substitute methods in producing this issue. The results of these deviations from normal may be visible to you. If the printing emergency persists, we may have to resort to still more apparent substitutes. But we intend to let nothing which we can now foresee stop us from bringing to you full-length, clear and typographically pleasing issues.

IT'S NEW!

. . . for the cutting of large Coniflex gears for power shovels and cranes, road machinery, ordnance, mining machinery, steel mill table drives and other heavy equipment.

GLEASON

No. 24A STRAIGHT BEVEL GENERATOR

FEATURES: Coniflex gears with localization of tooth bearing automatically produced in any desired amount . . . close and *fast* roughing of *heavy* pitch gears using Tanruf and Tan-Acruf Tools . . . hydraulic features and conveniently located controls for simple operations.

COMPLETING THE UNIT FOR CONIFLEX GEAR PRODUCTION

Assure accuracy and smooth surface finish . . . obtain the greatest degree of life from cutting tools . . . with the Gleason No. 12 Generator Tool Sharpener.

A running test on the Gleason No. 27 Hypoid Tester—imitating actual operating position assures maintenance of uniform quality of gears during production . . . establishes best position in gears in final assembly.

GLEASON Works
1000 University Avenue
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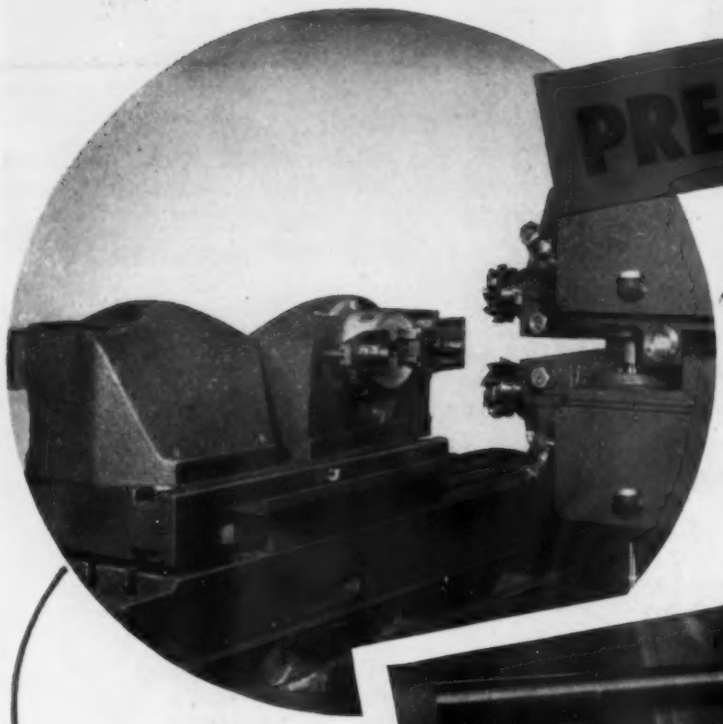
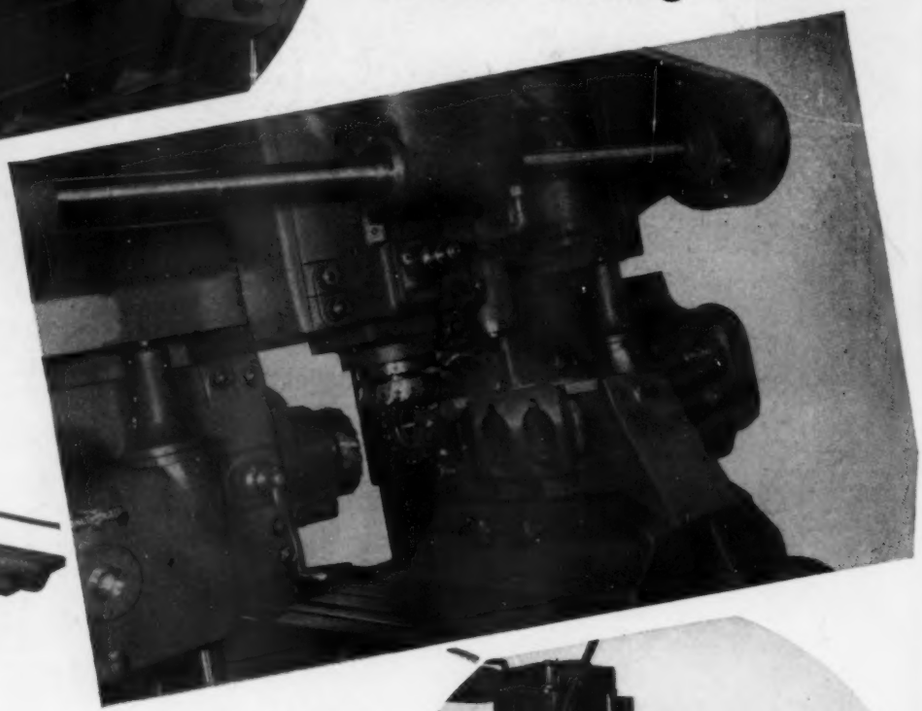
Builders of Bevel Gear Machinery for Over Eighty Years

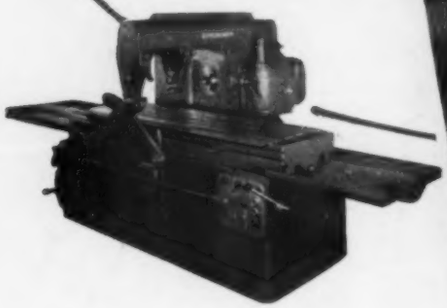
PRE-FAB Hydromatic Units

combine operations to reduce milling costs



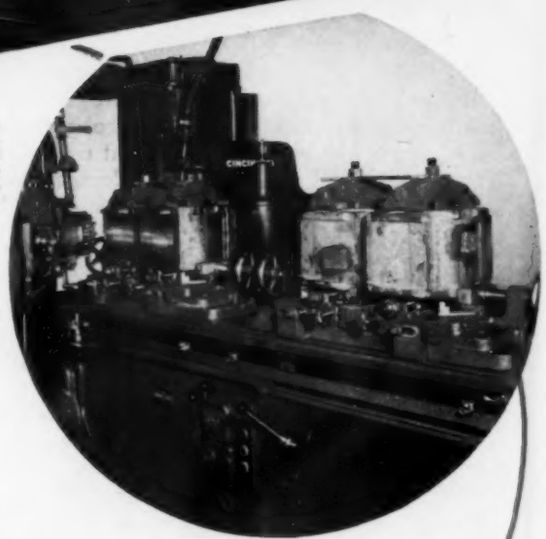


Above: Close-coupled spindle carriers on this No. 34-36 Plain Hydromatic combine operations. In one pass, two opposite slots are milled in aluminum pistons at a rate of 41 per hour.



CINCINNATI Plain Hydromatic Miller. Specifications for both plain and duplex machines may be obtained by writing for catalog M-1372-1.

Above: Milling cylinder blocks, three surfaces in one pass. Here, a No. 5-48 Duplex Hydromatic is equipped with a vertical spindle carrier supported on a fixed height rail. By combining cuts in this manner, one operation is eliminated, and production averages about 15 per hour.



This Duplex Hydromatic, No. 56-90 equipped with quick set-up features is tooled up to mill the channels in railroad journal boxes.

• New methods hold far more attraction to management when standard or semi-standard equipment can be used. In general, capital investment is lower, and if the need arises, the machines can readily be refitted and used for other purposes. These two outstanding advantages are offered by CINCINNATI Hydromatic Milling Machines. Built up on standard plain and duplex styles, these machines are designed to give you a selection of standard and complementary units, such as:

1. Close-coupled spindle carriers (illustrated at top of page).
2. Vertical spindle (center illustration), single or close-coupled.
3. Fixed height or adjustable bridge-type rail support for vertical heads.
4. Automatic variable feed to table.
5. Extra wide bed for increased capacity.

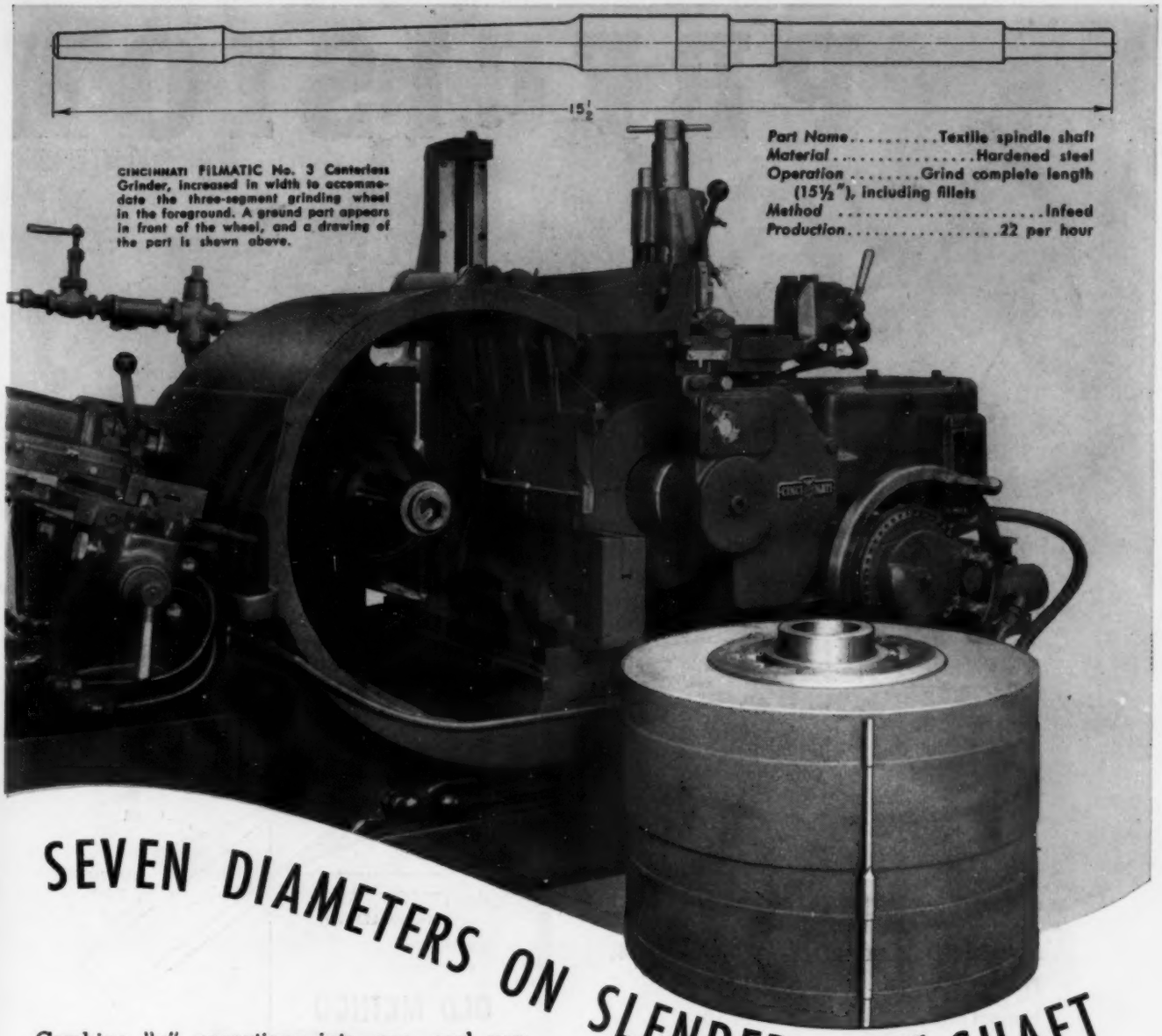
Perhaps the milling or other machining operations on parts in your shop could be combined at a big saving. The standard and complementary unit construction plan of CINCINNATI Hydromatics offers many possibilities. May we send engineering data? Ask for catalog M-1372-1.

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

CINCINNATI

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES



CINCINNATI FILMATIC No. 3 Centerless Grinder, increased in width to accommodate the three-segment grinding wheel in the foreground. A ground part appears in front of the wheel, and a drawing of the part is shown above.

Part Name.....Textile spindle shaft
Material.....Hardened steel
Operation.....Grind complete length (15½"), including fillets
Method.....Infeed
Production.....22 per hour

SEVEN DIAMETERS ON SLENDER 15½" SHAFT

ground in one operation

Combine "n" operations into one, and you divide their total cost by approximately "n". This simple mathematical relationship is demonstrated by the equipment and operation shown here. The parts are textile spindle shafts. They have seven diameters, two of which are tapered. All diameters on the complete length of the shaft, including fillets, are ground in one operation on a CINCINNATI FILMATIC No. 3 Centerless Grinder. ¶ As you might suspect, Cincinnati Application Engineers had a hand in this job. The machine was widened to take care of the extra wide wheels . . profile truing units over the grinding and regulating wheels accurately true them to the required shape . . a loading attachment lowers the part to the work rest blade between the wheels. ¶ The sound design of CINCINNATI Centerless Grinders, supported by the many advantages of FILMATIC grinding wheel spindle bearings, give Cincinnati Application Engineers fine basic material with which to devise new cost saving methods in precision grinding. These men would like to show you what can be done about reducing costs in your shop. Send blueprint and complete details, or arrange to visit us in person. Meanwhile, write for a copy of catalog G-570.

CINCINNATI GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CINCINNATI

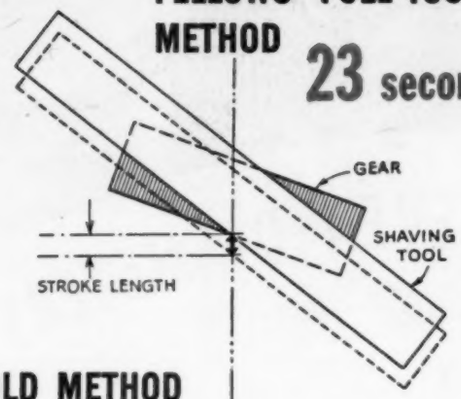
CENTER TYPE GRINDING MACHINES • CENTERLESS LAPPING MACHINES • CENTERLESS GRINDING MACHINES

PRECISION

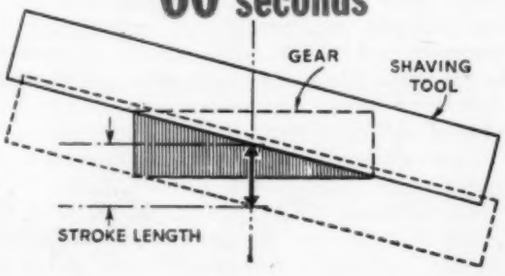
GEAR SPECIFICATIONS

Material (Steel Forging)	S.A.E. 1024
No. of teeth	23
Normal pitch	10
Normal pressure angle	14°
Helix angle	42° 36′ 30″
Face width	1″
Lead Limit	.0002″
Involute Limit	±.0004″

FELLOWS "FULL-TOOL" METHOD **23 seconds**



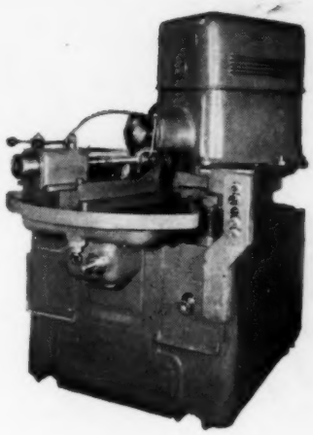
OLD METHOD **60 seconds**



GEAR SHAPERS · THREAD GENERATORS · CUTTERS · SHAVING AND BURNISHING MACHINES

FINISHED

in 23 seconds



Fellows "Full-Tool" Shaving More Than Doubles Output ... Prolongs Tool Life

Shaving as a finishing process can now play an important role in low-cost mass production. The Fellows "Full-Tool" method permits a shorter stroke, provides freer cutting and higher reciprocating speeds and consequent greater output. Cutting action is so distributed as to obtain an even finer tooth finish with less wear on the shaving tool.

Every production-minded manufacturer will want to know more about this new method of low cost gear finishing. For more complete information, write for the latest bulletin on the Fellows Method of "Full-Tool" shaving. Simply contact our nearest office.

Fellows

THE FELLOWS GEAR SHAPER COMPANY

Head Office and Export Dept., Springfield, Vermont. Branch Offices: 616 Fisher Bldg., Detroit 2. 640 West Town Office Bldg., Chicago 12. 7706 Empire State Bldg., New York 1.

GEAR MEASURING AND INSPECTION INSTRUMENTS · PLASTICS MOLDING MACHINES

Van Norman

No. 36 TABLE: 58"X13"

Manufacturers in all types of industries step up milling production, minimize errors and cut costs per man- and machine-hour with Van Norman Ram Type Millers.

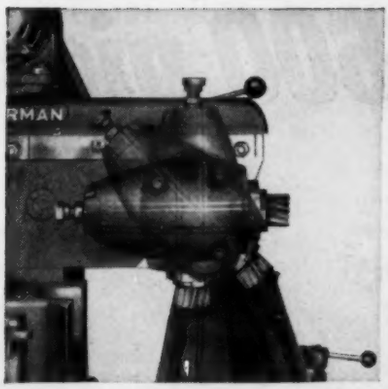
These versatile machines meet daily fluctuating milling requirements by enabling operators to perform horizontal, angular, or vertical milling, all with one machine. In addition, Van Norman Ram Type Millers cut idle operator and machine time as well as improve accuracy because most jobs can be carried through to completion in the original set-up. Other Van Norman advantages include front and rear *directional* control of all power feeds as well as six way rapid traverse, single lever feed selector, front and rear manual controls, heavy construction, massive cutterheads, anti-friction bearings and automatic lubrication.

See for yourself how these machines cut costs, improve accuracy and increase production in the toolroom, machine shop, experimental laboratory and pattern shop. Write: Van Norman Company, Springfield 7, Massachusetts.

RAM TYPE MILLERS

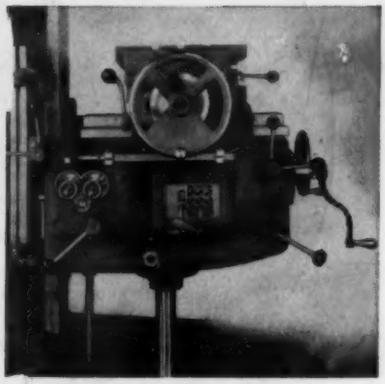
Meet Job to Job Requirements

Cut Idle Machine Time Up to 50%

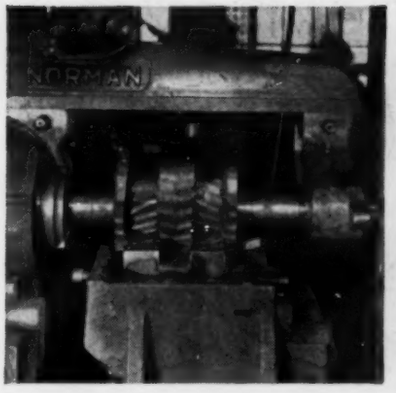


Adjustable cutterhead permits vertical, horizontal or angular milling . . . gives the work range of several single-purpose machines.

Adjustable cutterhead and movable ram in combination with the saddle crossfeed provide maximum versatility. (Subhead mounted on cutterhead.)

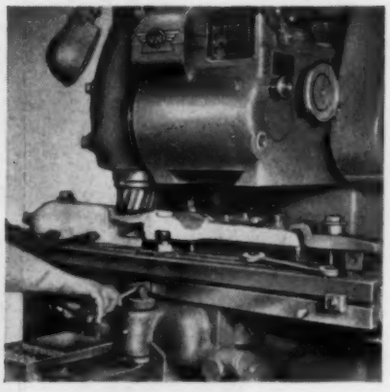


Front and rear control of hand and power feeds give complete visibility and control of operations from either location. Reduces worker fatigue.



Horizontal milling setup. The ram-type overarm with dovetail ways and outer support assures rigidity and accuracy.

With head locked in angular position the operator is taking an angular cut and operates the miller with rear controls.



The ram-type miller used with adjustable cutterhead in the vertical milling position . . . operator using front controls.

VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS

"It Pays to Van Normanize"

PIPE NIPP

450 pieces
3600 pieces

RLD'S LARGEST MANUFACTURER OF ALL TYPES

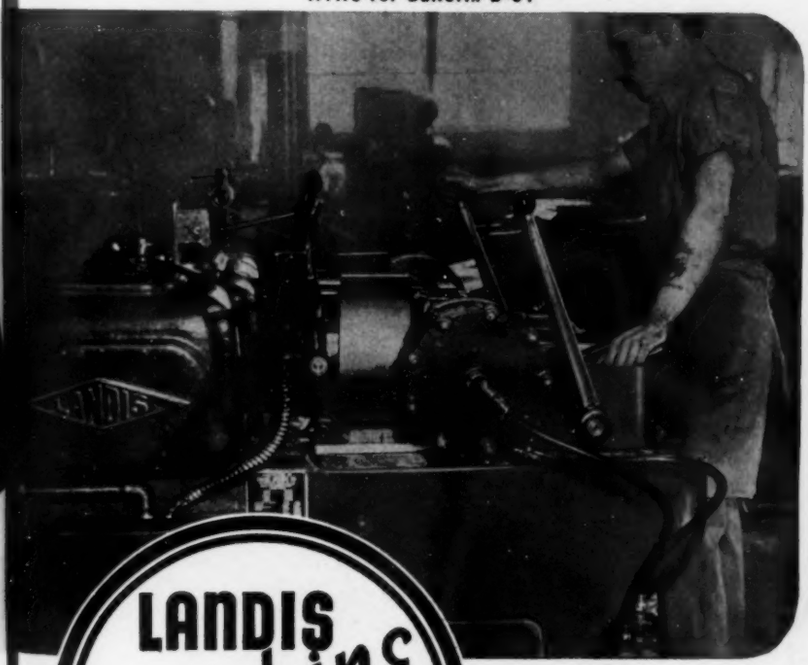
LES

per hour
per chaser grind

Such production is proof of "high production and low cost"—yet thread tolerances are held to specifications. These figures are production results of a manufacturer producing steel pipe nipples, using LANDMACO machines equipped with air-operated carriage fronts. Different conditions might make an even higher output possible.

LANDMACO Pipe and Nipple Threading Machines thread, ream, and chamfer in one operation. Built in 1¼" and 2" single- and double-head models, these machines are equipped with either internal or external trip heads.

Write for Bulletin D-84



LANDIS Machine COMPANY
WAYNESBORO PA., U.S.A.

OF THREADING EQUIPMENT

LANDIS MACHINE COMPANY
ENGINEERING DATA

Name of Part 3/4" x 2 1/2" Pipe Nipple
Material Galv Butt Weld Pipe
Thread Pitch 14
Thread Limits ± 1 1/2 Turns
Thread Length 13/16"
Cutting Speed 33 Ft. P.M.
Pieces per Hour 450
Chaser Grind 22° and 88°
Pieces per Chaser Grind 3600

ENGINEERING DATA

Name of Part 3/4" x 10" Pipe Nipple
Material Butt Weld Pipe
Thread Pitch 14
Thread Limits ± 1 1/2 Turns
Thread Length 13/16"
Cutting Speed 38.3 Ft. P.M.
Pieces per Hour 400
Chaser Grind 22° and 88°
Pieces per Chaser Grind 3400

ENGINEERING DATA

Name of Part 2" x 6" Pipe Nipple
Material Butt Weld Pipe
Thread Pitch 11 1/2
Thread Limits ± 1 1/2 Turns
Thread Length 1 1/16"
Cutting Speed 42.8 Ft. P.M.
Pieces per Hour 200
Chaser Grind 22° and 89 3/4°
Pieces per Chaser Grind 1800

ENGINEERING DATA

Name of Part 1 1/2" x 5" Pipe Nipple
Material Butt Weld Pipe
Thread Pitch 11 1/2
Thread Limits ± 1 1/2 Turns
Thread Length 1"
Cutting Speed 35.8 Ft. P.M.
Pieces per Hour 232
Chaser Grind 22° and 89 3/4°
Pieces per Chaser Grind 2000

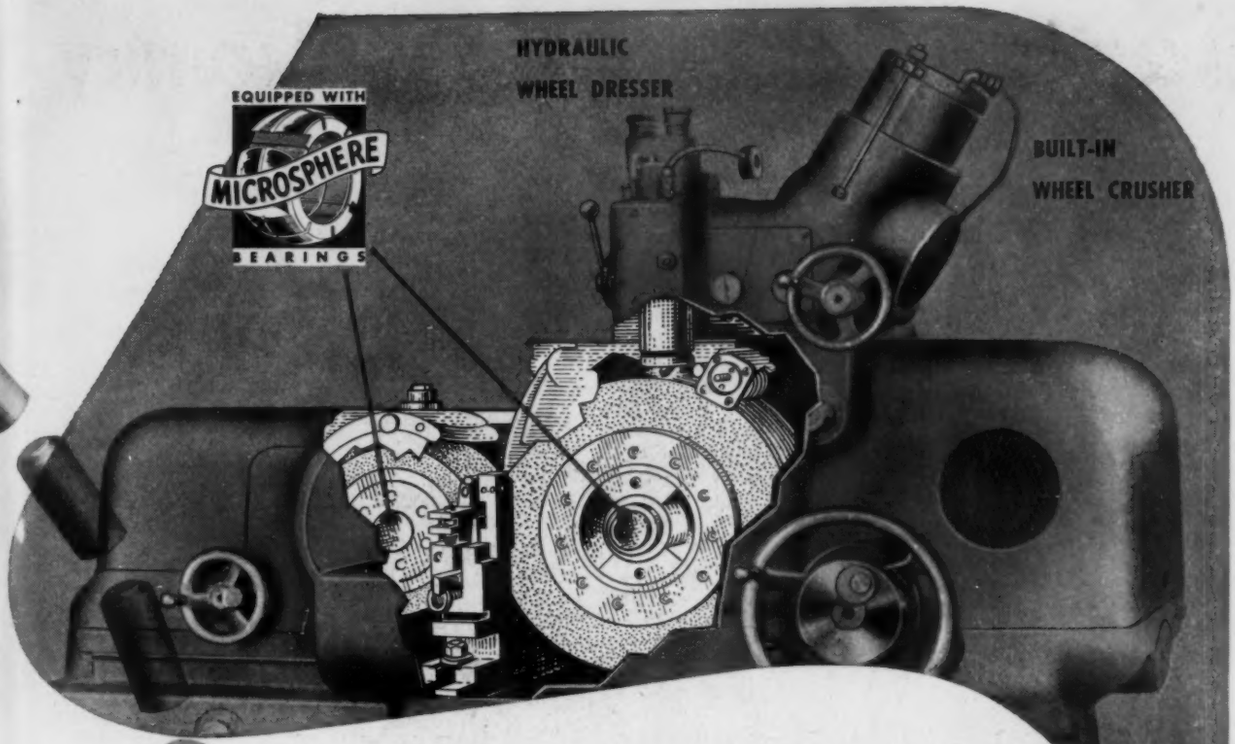
Exceptional Production and Accuracy

with centerless thread grinder

Exclusive vibrating type loader insures continuous flow of blanks thru machine.

LANDIS TOOL
Precision Grinders

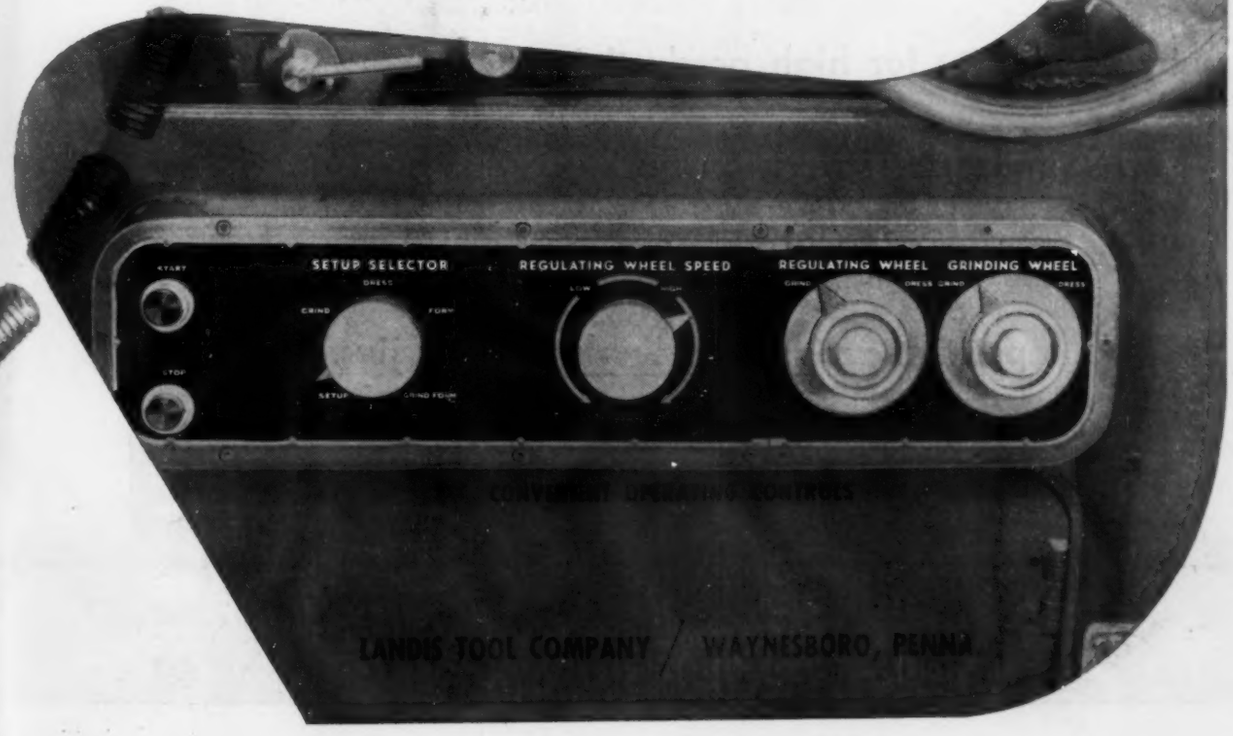
Production estimates and tooling suggestions given on the basis of your blueprints.

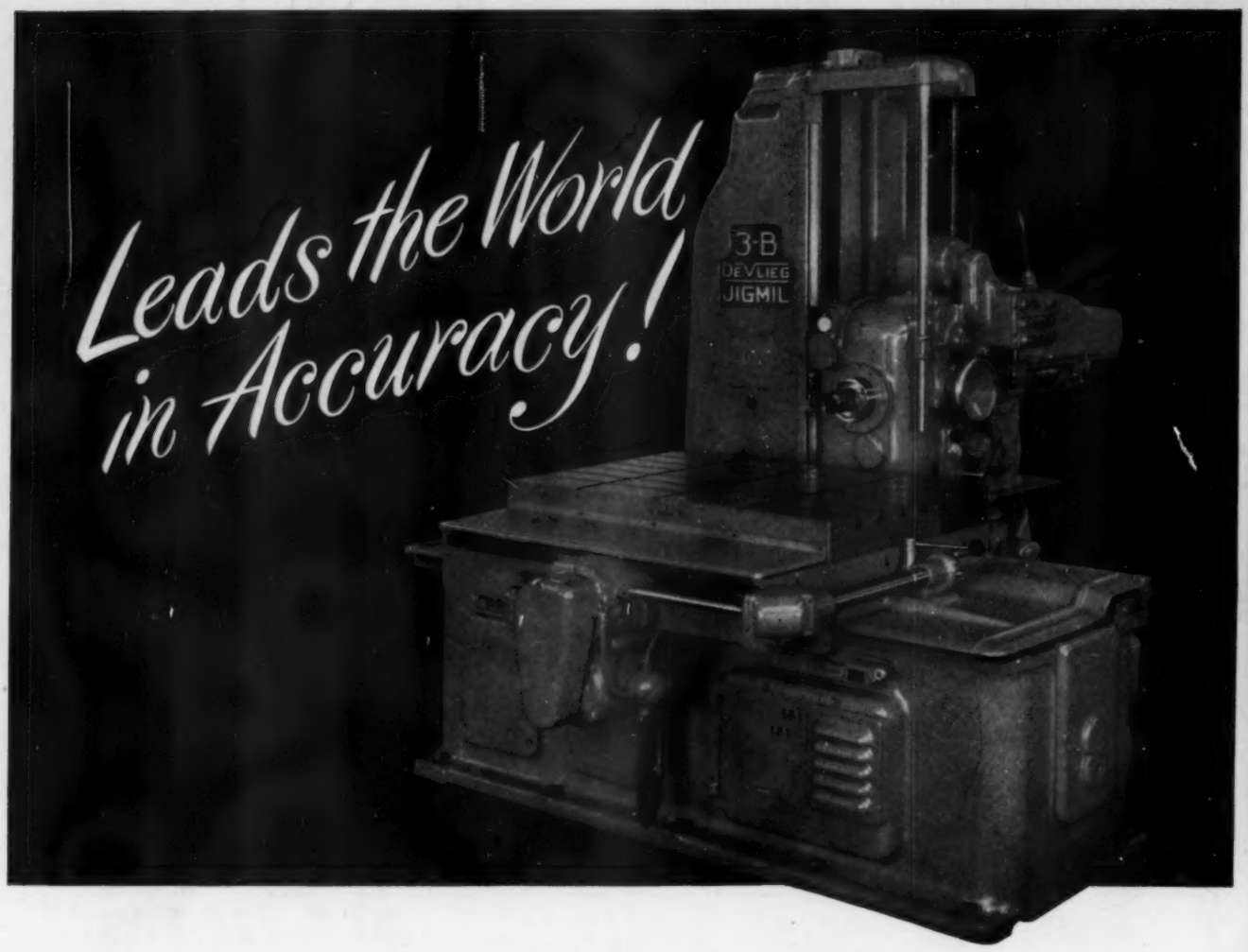


PRODUCTION —Actual production hardened steel blanks 1/2" long 5/16" and 3/8" diameter, approximately 2400 per hour. Other sizes in proportion.

ACCURACY —Threads meet Class 3 standards easily. For typical 5/16" screw a 5 minute crush dressing required once for each 20,000 screws.

RESULTS —Greater production; less inspection required; fewer rejects; bright, attractive finish.





The DeVlieg JIGMIL is now recognized as The World's Leader in the field of accurate boring, in addition to its unique capacity for high productivity on:

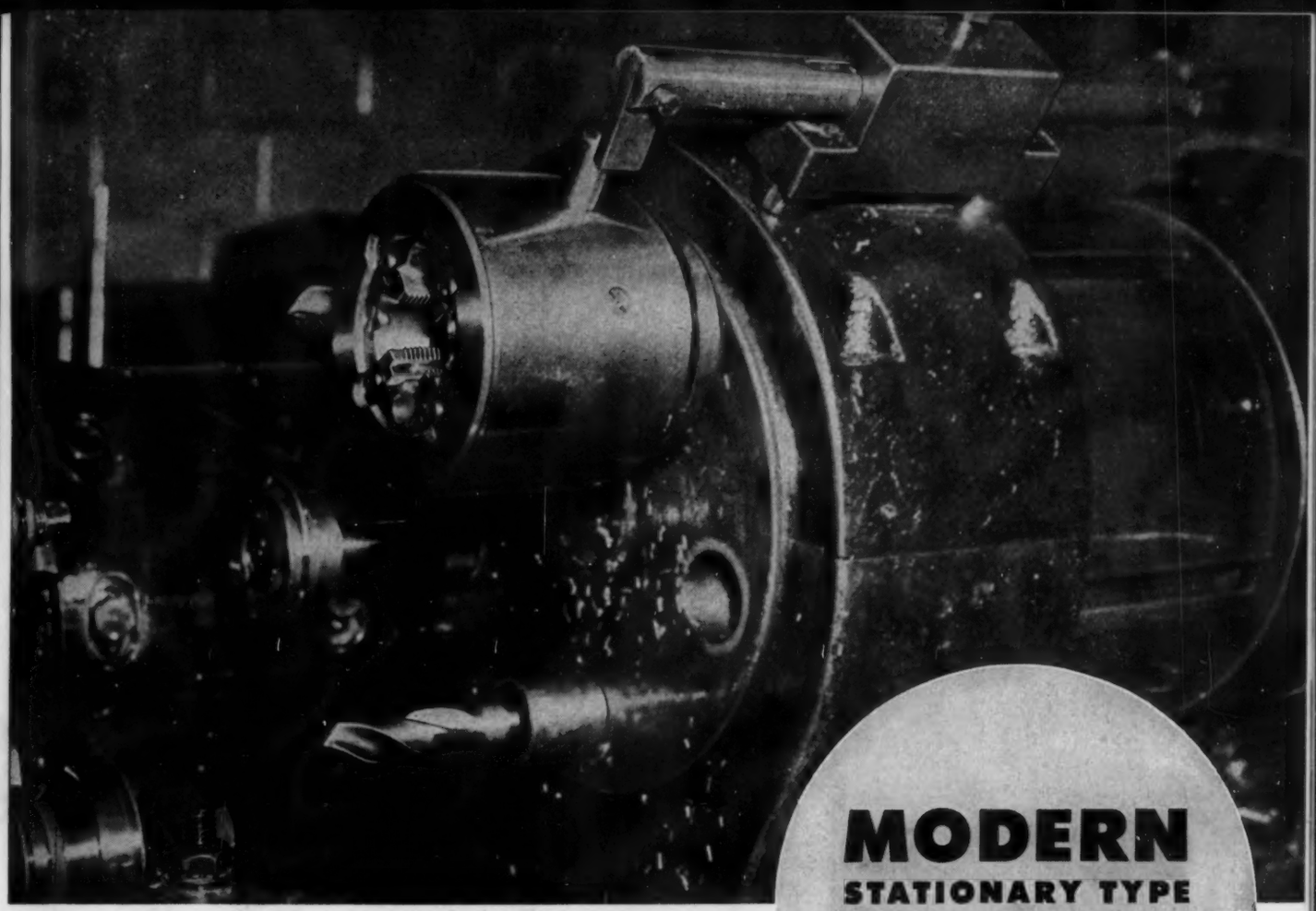
1. **Single part precision boring.**
2. **Tool, jig and die work.**
3. **Repetitive production work without jigs.**

Write today for new descriptive booklet.

DEVLIEG JIGMIL

DeVLIEG MACHINE COMPANY

450 FAIR AVE., FERNDALE 20, (DETROIT) MICH.



MODERN
STATIONARY TYPE SELF-OPENING DIE HEADS

Here a Modern Stationary Type Self-Opening Die Head is shown in operation on a Cleveland Automatic. The die head's floating shank compensates for any difference between the lead of the cam of the machine and the thread to be cut.

Modern Precision Tools Include . . . . .

- STATIONARY SELF-OPENING DIE HEADS
- ROTARY SELF-OPENING DIE HEADS
- STATIONARY COLLAPSIBLE TAPS
- ROTARY COLLAPSIBLE TAPS
- MODERN-MAGIC CHUCKS AND COLLETS
- SELF-OPENING STUD SETTERS
- INSERTED BLADE FACE MILLING CUTTERS
- SOLID ADJUSTABLE DIE HEADS
- ADJUSTABLE HOLLOW MILLING TOOLS
- UNIVERSAL CHASER GRINDING FIXTURES

The line of standard Modern Stationary Type Self-Opening Die Heads thread diameters from 1/8" to 7" in standard heads and up to 14" in special heads, accurately, fast and economically. They are adapted to practically every thread cutting operation within their capacity. Designed for use in hand screw machines, turret lathes and other machines where the die head is used in a stationary position and the work revolves.

Complete information will be furnished upon request.

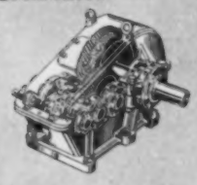
MODERN TOOL WORKS

DIVISION OF

CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

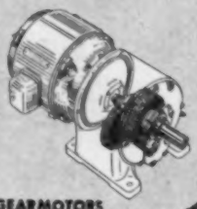
OTHER TYPES OF LINK-BELT POWER TRANSMISSION MACHINERY



HERRINGBONE GEAR SPEED REDUCERS

WORM GEAR SPEED REDUCERS

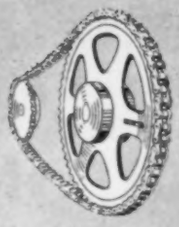
HELICAL GEAR SPEED REDUCERS



GEARMOTORS

ELECTROFLUID DRIVES

P.I.V. GEAR SPEED VARIATORS



SILVERLINK ROLLER CHAIN DRIVES

SILENT CHAIN DRIVES

STEEL AND MALLEABLE CHAIN DRIVES

V-BELT DRIVES

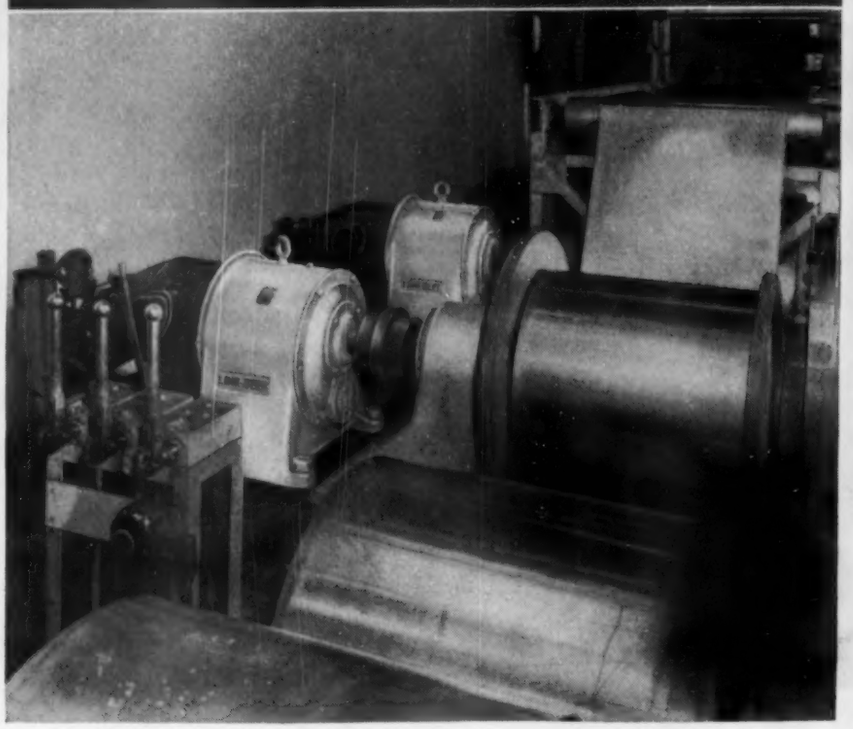
UNMOUNTED BALL AND ROLLER BEARING UNITS

ROLLER BEARING MOUNTED UNITS

BALL BEARING MOUNTED UNITS

BABBITTED BEARINGS

If the Problem Involves SPEED REDUCERS *Get Your Answer From* LINK-BELT!



Because Link-Belt manufactures four types of speed reducers, you are sure to obtain the type and size which will serve you most satisfactorily when you come to Link-Belt.

In the view above an interesting problem is solved with Link-Belt helical gear speed reducers, coupled with D.C. generators connected to coil holders in a strip steel plant. The generators provide back-drag to supply proper tension on strip or act as motors when feeding the end of a new coil up to welding position.

Link-Belt speed reducers and gearmotors combine efficiently with any of the various Link-Belt drives to provide efficient, compact and durable power transmission at the correct speed.

Call on Link-Belt for aid and counsel on any mechanical power transmission problem.

LINK-BELT COMPANY

Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8.
Offices, Factory Branch Stores and Distributors in Principal Cities.

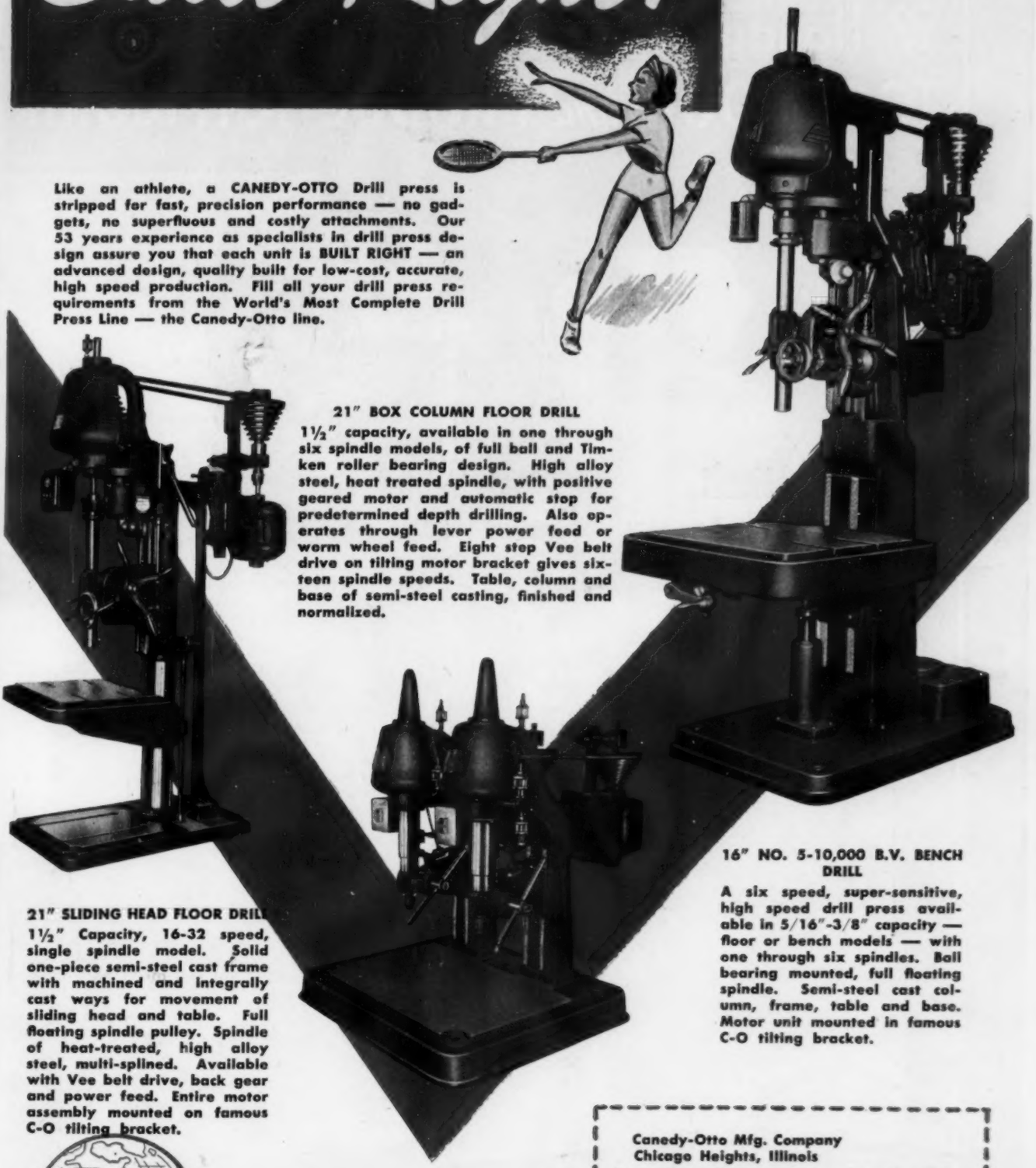
10,977-C

LINK-BELT

Power Transmission Machinery

Built Right!

Like an athlete, a CANEDY-OTTO Drill press is stripped for fast, precision performance — no gadgets, no superfluous and costly attachments. Our 53 years experience as specialists in drill press design assure you that each unit is BUILT RIGHT — an advanced design, quality built for low-cost, accurate, high speed production. Fill all your drill press requirements from the World's Most Complete Drill Press Line — the Canedy-Otto line.



21" BOX COLUMN FLOOR DRILL

1½" capacity, available in one through six spindle models, of full ball and Timken roller bearing design. High alloy steel, heat treated spindle, with positive geared motor and automatic stop for predetermined depth drilling. Also operates through lever power feed or worm wheel feed. Eight step Vee belt drive on tilting motor bracket gives sixteen spindle speeds. Table, column and base of semi-steel casting, finished and normalized.

21" SLIDING HEAD FLOOR DRILL

1½" Capacity, 16-32 speed, single spindle model. Solid one-piece semi-steel cast frame with machined and integrally cast ways for movement of sliding head and table. Full floating spindle pulley. Spindle of heat-treated, high alloy steel, multi-splined. Available with Vee belt drive, back gear and power feed. Entire motor assembly mounted on famous C-O tilting bracket.

16" NO. 5-10,000 B.V. BENCH DRILL

A six speed, super-sensitive, high speed drill press available in 5/16"-3/8" capacity — floor or bench models — with one through six spindles. Ball bearing mounted, full floating spindle. Semi-steel cast column, frame, table and base. Motor unit mounted in famous C-O tilting bracket.

CANEDY-OTTO MFG. CO.

CHICAGO HEIGHTS, ILL.

Canedy-Otto Mfg. Company
Chicago Heights, Illinois

Please send illustrated catalog No. 90S.

NAME .....

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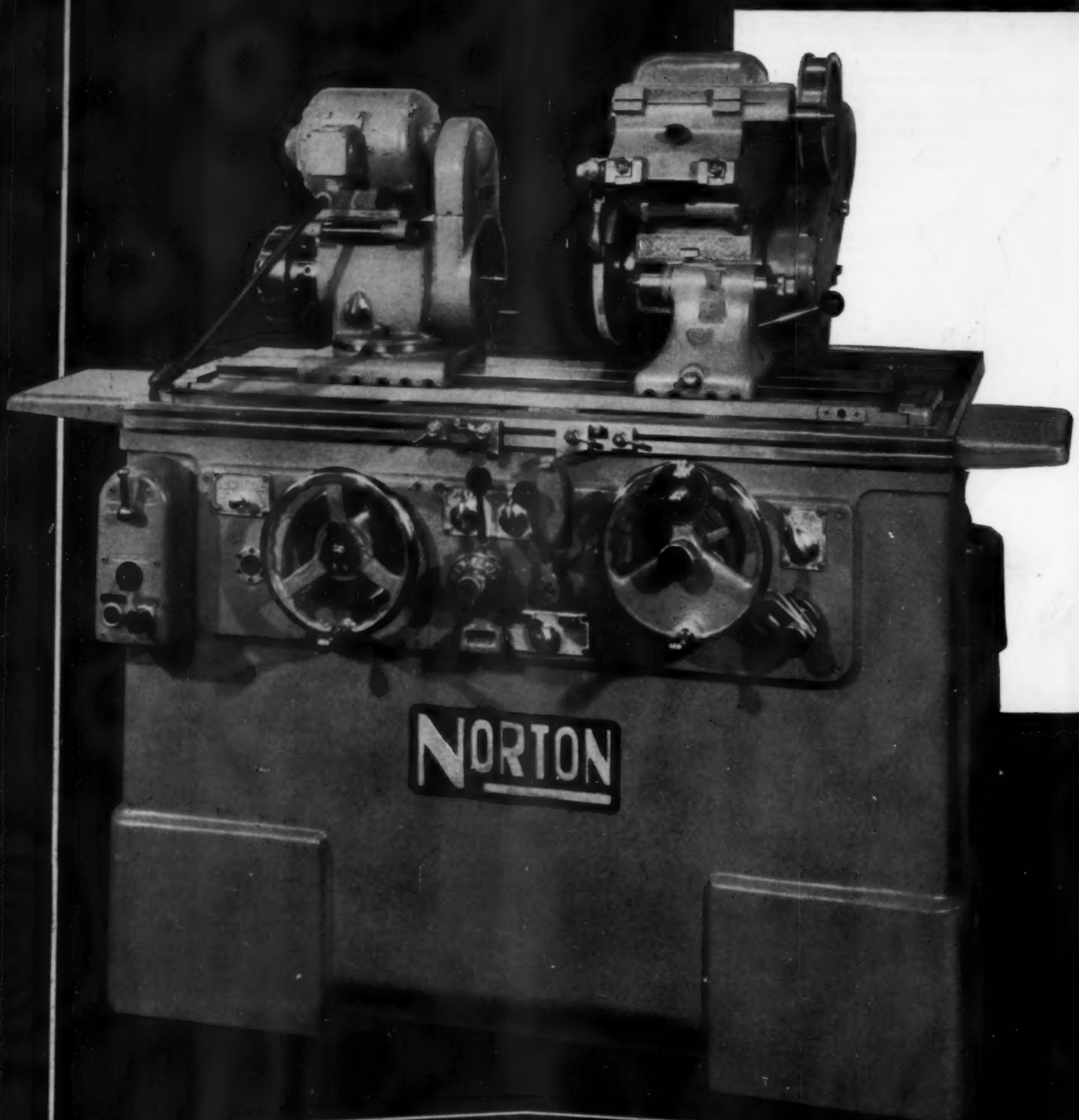
A Handy Flexible Machine for the TOOL ROOM *and* PRODUCTION WORK



NORTON GRINDERS
and Lappers

The new
NORTON 10" x 20" UNIVERSAL GRINDER

THIS new NORTON Universal will bring economy to your grinding jobs that require a multipurpose machine in this size range.

It is precise; it is extremely versatile; it makes rough cuts as readily as it produces the finest precision finishing. The convenience of its controls and adjustments give it a degree of handling ease that is outstanding.

Here are some highlights:

- Head and Footstock positions interchangeable
- Wheel Spindle designed for right or left-hand drive
- Internal Grinding Attachment hinged to front of wheel slide
- Wheel Head easily positioned for varied set-ups—swivels 360°
- Additional amount of wheel head adjustment in upper portion of slide
- Dovetail surface on front of wheel head for special brackets

Catalog No. 170 gives full details of the Norton 10" x 20" Universal—write for copy.

NORTON COMPANY, WORCESTER 6, MASS.

Distributors in All Principal Cities

M-555

A UNIQUE HEADSTOCK

A hollow spindle takes up to 1" diameter stock clear through

No. 10 Jarno taper each end of spindle

Swivels 360°

3" standard lathe cam lock nose on one end of spindle

Speed changes from 50 to 500 r.p.m. by finger-tip electronic control

Jogging control provided

CYLINDRICAL—exceptionally smooth hydraulic traverse with independent right and left-hand dwell control—automatic wheel feed at each reversal.

INTERNAL—individually powered internal spindle permanently hinged to front of wheel slide for maximum convenience and rapid set-ups.

The CONE AUTOMATIC MACHINE COMPANY *sees many* GOOD THINGS AHEAD

It is reported that . . . . . .

Fitchburg Grinding Machine Corp. has a machine that grinds automobile valves to size at the rate of 2,160 per hour.

get ready with CONE for tomorrow

Small glass globules of exploded glass, similar to popcorn are made by Dant & Russell of Portland, Oregon, and are used to replace sand in plaster.

be ready with CONE for today

Reaction of corn sugar with hydrogen to form sorbitol is accomplished in minutes by the new high-pressure catalytic process of Atlas Powder Co.

get ready with CONE for tomorrow

The new plant of Houston Oxygen Co. will be the first to produce acetylene commercially by the electric "glow" process.

be ready with CONE for today

A library of rubber technology, sponsored by the American Chemical Society, will be set up at the University of Akron.

get ready with CONE for tomorrow

E. I. duPont de Nemours & Co. claims that its new color film "S-T Tripac," can be processed as simply and quickly as black and white.

be ready with CONE for today

The wheels on the new Corlett-Turner bench grinder can be changed in nine seconds.

get ready with CONE for tomorrow

U. S. Rubber Co.'s new automobile cushions can be inflated to any pressure that the passenger likes.

be ready with CONE for today

The new Tournamover straddles an entire building, up to 25 feet, picks it up and moves it to a new location.

Temperatures down to −456° F. are possible with the new helium cryostat developed by Arthur D. Little, Inc.

get ready with CONE for tomorrow

Roughness measurements around internal and external surfaces of rotation can now be made by means of a Rotary Piloting Fixture offered by Physicists Research Co. for use with the Profilometer.

be ready with CONE for today

Anthracite Industries, Inc., announces that its new coal-burning heater is 38% more efficient than ordinary furnaces and will be made in steam, hot water and hot air models for either domestic or commercial use.

Studies at the National Bureau of Standards show that diamonds are highly sensitive to gamma rays and may be used like a Geiger counter.

get ready with CONE for tomorrow

Chance Vought has a contract to build a new fighter plane that will be made almost entirely of their Metalite sandwich material — a balsa and aluminum lamination. Tests show the new material to be lighter and stronger than conventional materials.

be ready with CONE for today

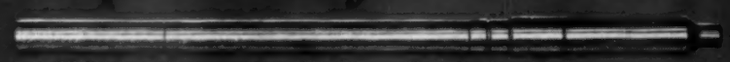
At the Fort Gibson, Oklahoma, dam, ice cubes are being mixed with concrete to cool it before pouring.

get ready with CONE for tomorrow

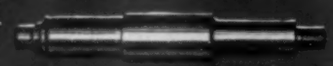
The incredible speed of 11 million pictures per second has been achieved by a motion picture camera developed at the University of Rochester.

FOLLOW THESE PAGES FOR NEWS OF PROGRESSIVE PRODUCTION

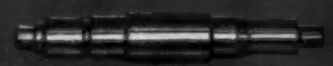
Emphatically Conomatic!



25⅝" long, 16 operations in 63 seconds from 1⅜" dia. hot rolled.



10⅞" long, 16 operations in 65 seconds from 1 41/64" dia. SAE 4620.



10⅝" long, 12 operations in 54 seconds from 1⅝" dia. SAE 3115.

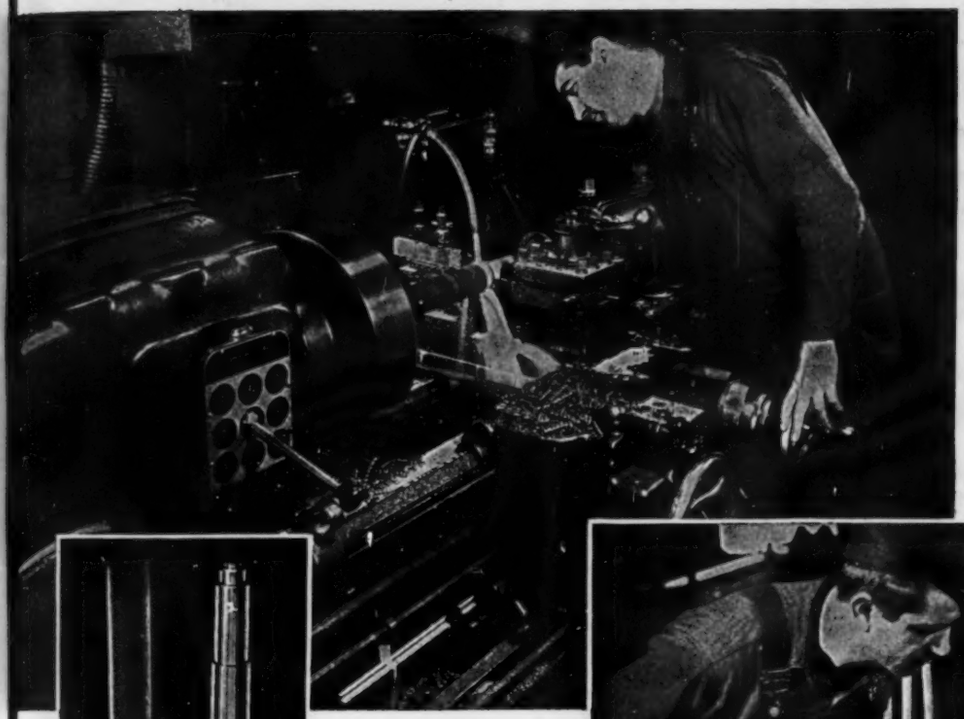
Any good multiple spindle automatic should handle the ordinary run of shaft work. But Conomatics are also adaptable to the unusually *tough* jobs. The illustrations show this plainly.

Ask your CONE *representative to show you our new color motion picture*

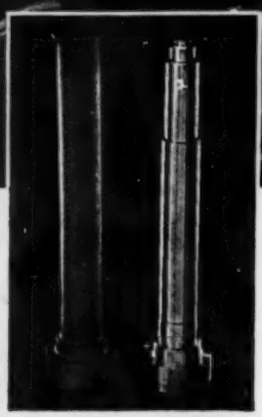
CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U.S.A.

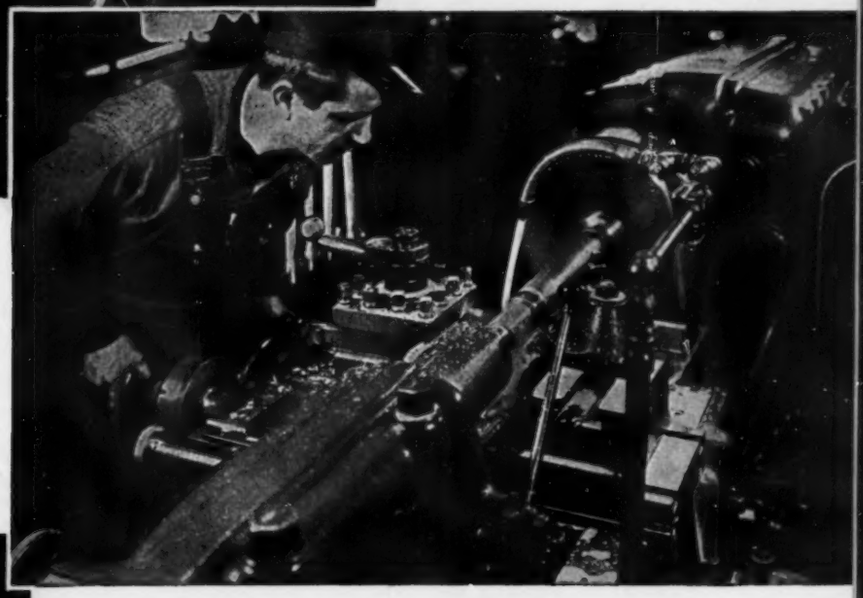
MINUTES INTO PROFITS...



20-In. "AMERICAN" Multi-Production Lathe, turning elevating pinion shafts from rough forgings for 40 M.M. anti-aircraft guns.



THIS to THIS in 18 minutes



This is no stunt! It's a steady production job day in and day out. Total floor to floor time, **18** minutes. Cutting speed, 175'. Feed, .015". Maximum depth of cut, 3/8". Material, S.A.E. 4640 steel—heat-treated.

PRODUCTION EQUIPMENT

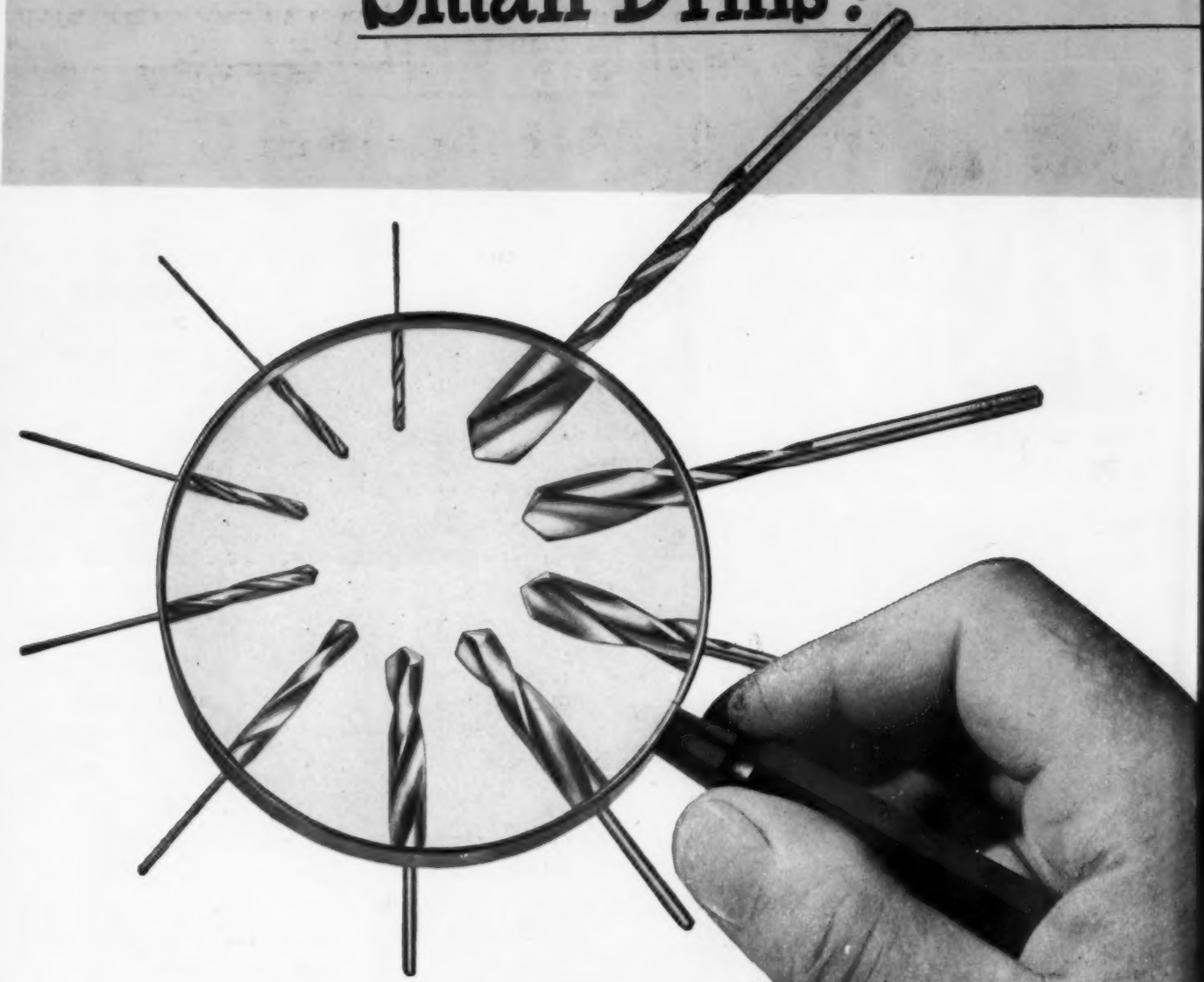
Front and rear tool holders. Automatic length stops. Direct reading cross feed dials with indicating clips. Built-in roller bearing tailstock center. This is the kind of performance that transforms minutes into profits.

THE AMERICAN TOOL WORKS CO.

Cincinnati, Ohio, U. S. A.

Lathes and Radial Drills

Magnifying Glass Shows Clue to Lower Costs with Small Drills!



Morse "Multi-Inspection-Test-Control"

Provides Peak Small Drill Quality for ACCURATE Hole Size

We've placed these little fellows under the magnifying glass for a better look. Morse checks and tests and checks again, at every step of the manufacturing process. When a drill has been okayed by the Morse multi-inspection system, the user is certain of a small drill made to the closest tolerances — a tool that's dimensionally accurate with just the right degree of hardness and toughness — a drill that's scientifically ground and precision pointed.

Remember too, Morse small drills are *double-drawn* for increased toughness while maintaining their predetermined degree of hardness . . . and given special heat treatment to assure uniformity. Result: tools that appreciably lower small part production costs and step up "line" efficiency via *accurate* size holes drilled faster.

Whether your needs call for "bantam" size drills or the big Morse "block busters," Morse has the tool to cut down your costs. Your Industrial Supply Distributor can aid you in obtaining the proper Morse recommendation for *your* job on small or large drills and other high quality cutting tools.

Accuracy, Quality, Uniformity: the MORSE Code of Cutting-Tool Manufacture

MORSE TWIST DRILL & MACHINE COMPANY

The Original Manufacturer of Twist Drills

NEW BEDFORD, MASSACHUSETTS

New York Store: 130 Lafayette St. • Detroit Store: 2952 East Grand Blvd. • Chicago Store: 570 West Randolph St. • San Francisco Store: 1180 Folsom St.

MAKE HARD SET-UPS
UP TO 50% LESS

Kearney & Trecker's New Milling Machines with Built-In Chuck-Type Table Use Standard Tools to Set-Up Any Workpiece — Eliminate Expensive Workholding Fixtures.

The secret of using Kearney & Trecker's new milling machines with Built-In Chuck-Type Table lies in especially designed interchangeable standard tools or accessories that readily adapt themselves to any set-up. Thus the Built-In Chuck-Type Table actually eliminates the need for *costly* workholding fixtures.

You'll find hard-to-hold workpieces with irregular or curved contours easily clamped and leveled using combinations of spring and screw jacks and various styles of vise jaws which fit on standard bases. Similarly a variety of bumper-stops may be used as the work demands.

In actual shop tests, workpieces both large and small, simple and complex, have been set up and machined in fractions of the time formerly required. What's more, the simplicity of set-ups has materially reduced operator fatigue and provided greater rigidity plus more accurate finished results.

Kearney & Trecker milling machines with the Built-In Chuck-Type Table are available now in three standard working ranges, plain or vertical styles: (1) 34″ power table feed — Models 2K, 3H and 20 CSM. (2) 42″ power table feed — Models 3K, 4H and 30 CSM. (3) 50″ power table feed — Models 4K, 5H and 50 CSM. Accessories include screw and spring jacks, bumper stops and a variety of interchangeable, reversible vise jaws with hard, soft, plain, serrated, flat or radius faces depending on the surface or material to be clamped.

If you are planning on new milling machine equipment in your shop — it will pay you to get complete details on the new Kearney & Trecker milling machines with the Built-In Chuck-Type Table. Contact your nearest Kearney & Trecker Office or Dealer, or write direct to Kearney & Trecker Corporation, 6784 W. National Ave., Milwaukee 14, Wisconsin.

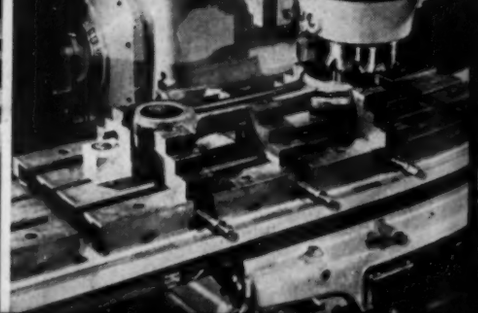
KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS

HOW INTERCHANGEABLE TOOLS FOR CHUCK-TYPE TABL

Standard tool bases quickly position in large specially designed table slots. Reversible vise jaws rigidly bolt to bases.

Variety of standard bumper-stops available to fit almost any set-up. Note different heights and positions possible.

Here's how quick positioning of base mounting of jaws and single bumper stop combine to make fast, rigid set-u

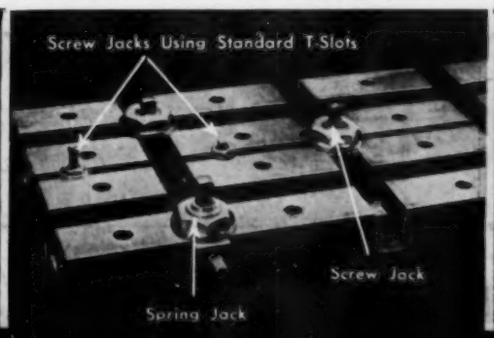


EASY IN TIME

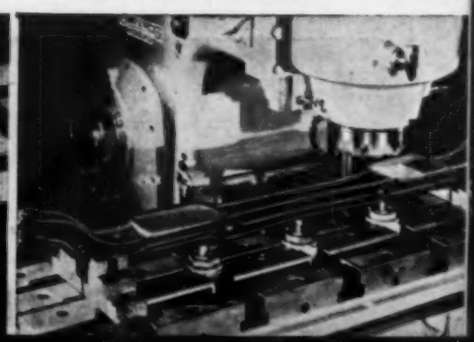
MAKE EASY SET-UPS—ELIMINATE EXPENSIVE FIXTURES

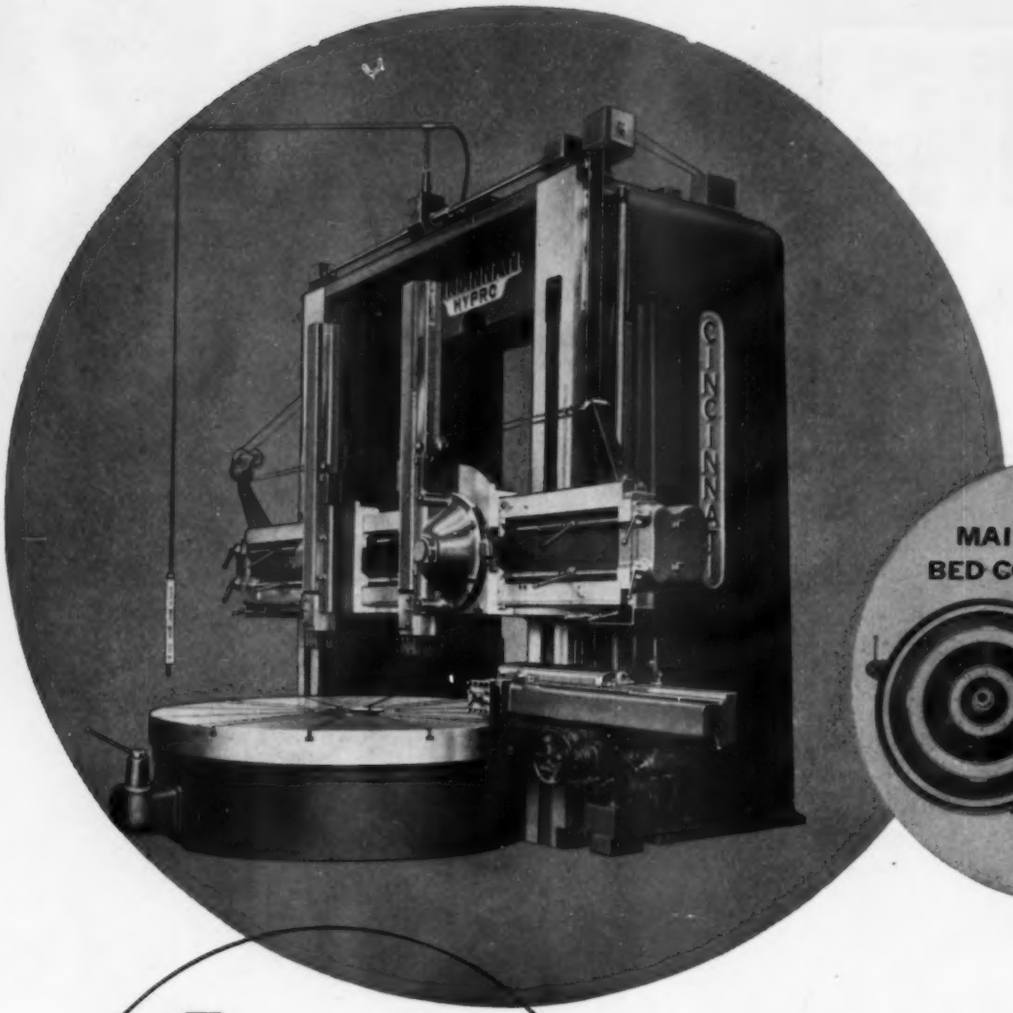
Curved surfaces on workpieces are easily clamped using radius-face, reversible vise jaws rigidly bolted to standard bases.

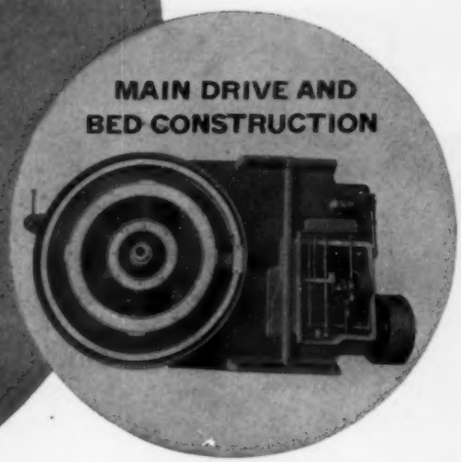
You get quick, accurate leveling on any workpiece using a variety of screw or spring jacks. Note various positions.



Here's typical, fast, simple set-up for carbide milling an axle part using both screw jacks and serrated vise jaws.







4 MORE GOOD REASONS FOR THEIR AMAZING PERFORMANCE

CINCINNATI HYPRO Boring Mill

10-FOOT — 12-FOOT

1. One piece speed box and bed construction, providing rigidity and preventing misalignment of shafts
2. Hardened steel forged gears mounted on multiple splined shafts running in anti-friction bearings
3. Anti-friction bearing table mounting with 3 load carrying tracks; outside track nearly full diameter of table
4. Automatic pressure lubrication to all units and parts, interlocked with main drive motor

THE CINCINNATI HYPRO PLANER COMPANY

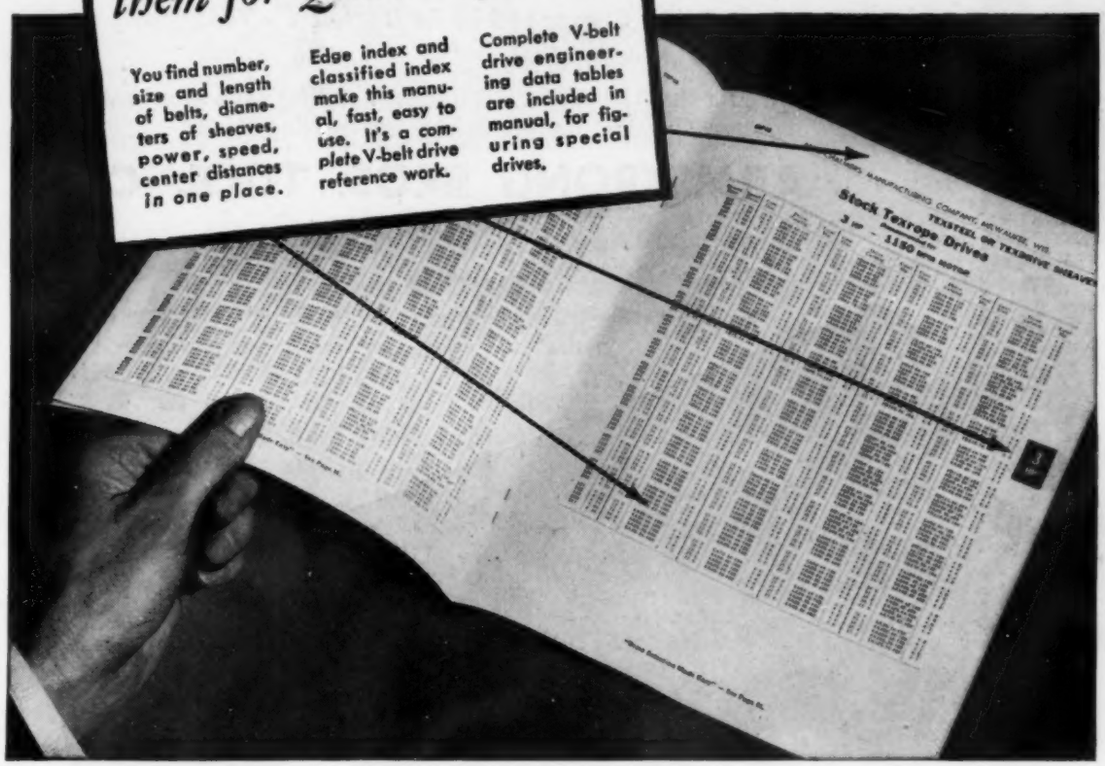
PLANERS · BORING MILLS · PLANER TYPE MILLERS

CINCINNATI, OHIO

90% OF ALL V-BELT DRIVE PROBLEMS SOLVED ECONOMICALLY WITH TEXROPE

Pre-Engineered Drives

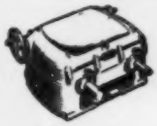
TEXROPE .. Greatest Name in V-Belt Drives


This New Manual Lists them for Quick Reference
You find number, size and length of belts, diameters of sheaves, power, speed, center distances in one place.
Edge index and classified index make this manual, fast, easy to use. It's a complete V-belt drive reference work.
Complete V-belt drive engineering data tables are included in manual, for figuring special drives.
Stock Texrope Drives

"Super 7" V-BELTS
Five Types — Sizes to suit every power transmission job.

Texsteel, Texdrive, "Magic-Grip"
— sheaves in a full range of sizes, grooves.

"Vari-Pitch" SHEAVES
Exact variations in speed, stationery or motion control.



SPEED CHANGERS
Speed variations up to 375% at the turn of a crank.

ENGINEERING
Finest V-Belt engineering talent in the world—at your call.

TEXROPE "Super 7" V-Belts result from the cooperative research of two great companies — Allis-Chalmers and B. F. Goodrich. They are sold only by A-C.

USING STOCK BELTS AND SHEAVES, Texrope engineers have selected the *best* drive for each requirement . . . the drive most economical in first cost and in maintenance.

Only Allis-Chalmers offers you this complete Pre-Engineered drive manual. It is the product of 23 years of industrial V-belt drive experience, the finest engineering talent in the business.

Here is a book that will save you time and money in the purchase of V-belt drive equipment. Copies have been sent to many Texrope users and dealers. If you don't have a copy yet, write for Texbook No. 20P40. ALLIS-CHALMERS, MILWAUKEE 1, WIS. A 2335

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ALLIS-CHALMERS

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A CENTURY OF SERVICE to Industry THAT MADE America Great

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More Tools Per Man for More Profit

Even when labor was cheap and tools were costly, it was the best tooled shops that prospered. Now with wages higher and the work days shorter, it becomes imperative that every worker be supplied with every tool that will increase his hourly production.

See that each lathe, planer and shaper operator has the correct ARMSTRONG TOOL HOLDERS for each operation he performs. Equip each machine with its full complement of ARMSTRONG Setting-up tools. Use better balanced, handier ARMSTRONG WRENCHES on machines and assembly lines. Specify ARMSTRONG Drop Forged "C" Clamps and Lathe Dogs. . . . Today, only quality tools can be truly economical.

Write for the ARMSTRONG Catalog. It has page after page of production-increasing, cost-cutting tools.

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"The Tool Holder People"

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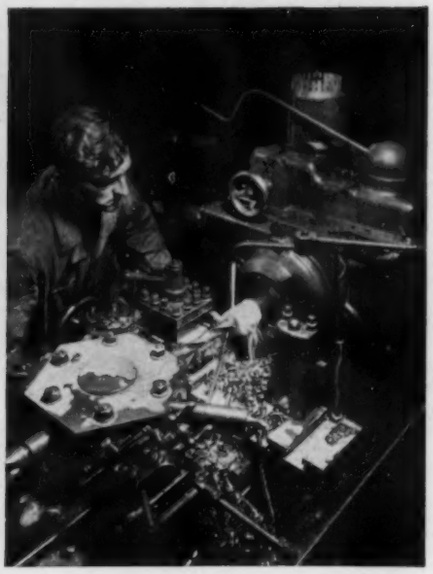
(b) ARMSTRONG CA Tool Holders and ARMALOY Cast Alloy Cutters

You can machine it.....



better...faster...for less

Better, because the inherent precision of Warner & Swasey Turret Lathes holds close tolerances and produces fine finishes —often eliminating all need for further machining. At the Oil City Brass Works, Beaumont, Texas, for example, a Warner & Swasey No. 5 Universal Turret Lathe holds tolerances of .0005" on operations like the one in this picture, turning and boring a "Bronzoid" bushing.

Faster, because the power and rigidity of a Warner & Swasey permit heavy combined cuts at high speeds. In the turning operation shown above, a Warner & Swasey 3-A Heavy Duty Turret Lathe owned by the Reliance Electric and Engineering Company, Cleveland, is taking heavy facing and outside cuts simultaneously for a 60% time saving over previous machining methods.

For Less, because the speed, accuracy and ease of operation of a Warner & Swasey all combine to cut machine time and scrap loss. *Warner & Swaseys show lower maintenance costs, too!* In the Baltimore Plant of the Bartlett Hayward Division of Koppers Company, seven Warner & Swasey Turret Lathes showed a maintenance cost for a seven-year period of only $4.09 each per year!

...with a Warner & Swasey

Why not let a Warner & Swasey representative study your metal turning operations? His recommendations on new machines, accessories or tooling may also give you more accurate, faster production at lower cost.

WARNER & SWASEY
Machine Tools
Cleveland

TURRET LATHES, MULTIPLE AND SINGLE SPINDLE AUTOMATICS, PRECISION TAPPING AND THREADING MACHINES

The Hardest Possible Metal Sawing

. . . cutting off test specimens in the Metallurgical Laboratory of this giant steel plant. There is no time for pampering here. Each saw must handle anything that comes, as it comes — the hardest steels and toughest alloys, in all degrees of hardness — in any size, any form or condition — because each heat, each drawing, and each forming run has to be tested.

The steel mill where these pictures were taken reports that these saws have been operating 24 hours, 7 days a week for the last five years. Maintenance cost has been practically non-existent. Furthermore, the efficiency of these saws has made possible the elimination of an equal number of other sawing machines in the department.

The answer to your cut-off problem, whether large or small, will be found in our new C48 catalog. The services of our field engineers are also available in every locality. Send for either or both now.

ARMSTRONG-BLUM MFG CO.

"The Hack Saw People"

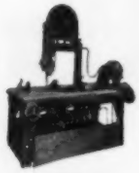
5700 BLOOMINGDALE AVE. CHICAGO 39, U.S.A.

No. 1, No. 2 Series
Capacity: 4"x4"
Capacity: 6"x6"

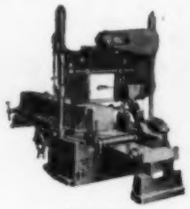
No. 4B Series
Capacity: 6"x6"

No. 6 Series
Capacity: 6"x6"

No. 9A Series
Capacity: 10"x10"



No. 8 Series
Capacity: 18"x18"



No. 18 Series
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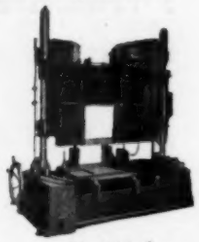


No. 24 Series
Capacity: 24"x24"

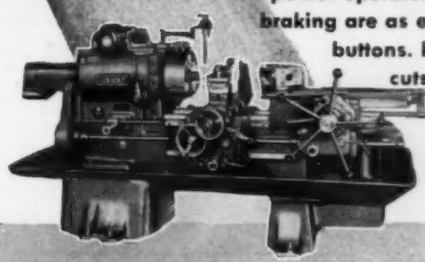
MARVEL *Metal Cutting* **SAWS**

Better Machines–Better Blades

GISHOLT TURRET LATHES

Finger-tip spindle control starts, stops, or reverses the spindle. Saves time--saves effort--saves money

It's power-operated. Clutching and braking are as easy as pressing buttons. Instant response cuts time lag, steps up production



GISHOLT MACHINE COMPANY *Madison 3, Wisconsin*

The GISHOLT Round Table represents the collective experience of specialists in the machining, surface-finishing, and balancing of round and partly round parts. Your problems are welcomed here.

turret lathes • automatic lathes • superfinishers • balancers • special machines

Jones & Lamson

Ground Thread Chasers for 25 years!

FIRST and FINEST...

All models of Jones & Lamson RADIAL TYPE Automatic Opening Threading Dies are equipped with GROUND THREAD CHASERS. They are the ideal investment for general threading work involving relatively small lots and diversified pitches. They will lower your tooling inventory too, because standard chaser sets are immediately available from factory stock.

- Ground Thread Chasers for ALL Models
- Class III Accuracy Guaranteed

RADIAL DIE HEADS

VERSATILITY—Will cut right or left hand threads, coarse or fine pitch. Capacities from No. 8 to 4¼".

STOCK REMOVAL—Unbeatable for coarse pitch, heavy duty threading such as Modified Square, 29° Acme, Worm or other threads.

STRENGTH—Every part is of solid steel, hardened and precision ground — no built-up sections.

FLOAT—All models are built with both eccentric and longitudinal float.

SIZE ADJUSTMENT—External micrometer adjusting screw for precise hand setting to exact pitch diameter.

ROUGH & FINISH LEVER—Heavy roughing cuts, followed by light, accurate finishing cuts can be taken with the same set of chasers.

Jones & Lamson

JONES & LAMSON MACHINE COMPANY
Springfield, Vermont, U. S. A.

Manufacturer of: Universal Turret Lathes · Fay Automatic Lathes · Automatic Double-End Milling and Centering Machines · Automatic Thread Grinders · Optical Comparators · Automatic Opening Threading Dies and Chasers · Ground Thread Flat Rolling Dies

Special Taps? YOU BET!

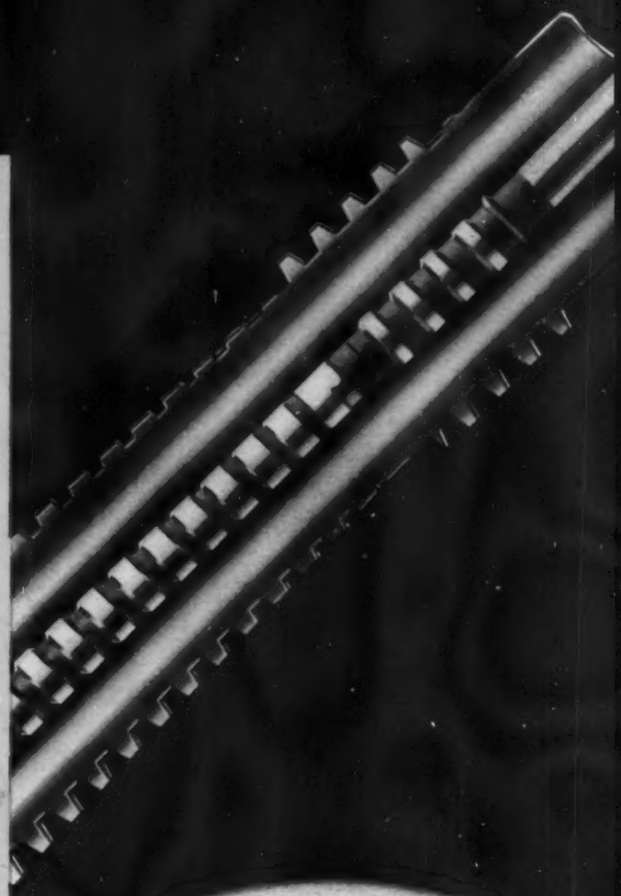
The tap user who needs a type or size not listed in the GTD Catalog can put his threading problem up to "Greenfield's" staff of threading tool engineers with complete assurance that he will get the tap that will do the job. A special thread form or pitch? A special point? An unusual shank or square? A reamer pilot? Whatever the problem, there are 75 years of tapping know-how ready to solve it, plus the ingenuity of men trained to creative engineering.

From the drawing board, your "special" goes to a new "specials" department where only specials are made; it is not sandwiched into the production schedule between lots of regular taps. Here are the latest in tap-making machines. Here are the best of the toolmaking craftsmen. Here is an inspection set-up usually found only in gage-making plants.

No matter how complicated your "special" may be, it is made with greatest speed — and at the most reasonable cost. This is the ultimate test of special tap-making ability.

"Greenfield" carries in stock hardened blanks in all standard sizes and dimensions which can be finished to special pitches or thread forms at short notice.

If you have a special tap problem, get in touch with the "Greenfield Man" through your nearest "Greenfield" distributor.



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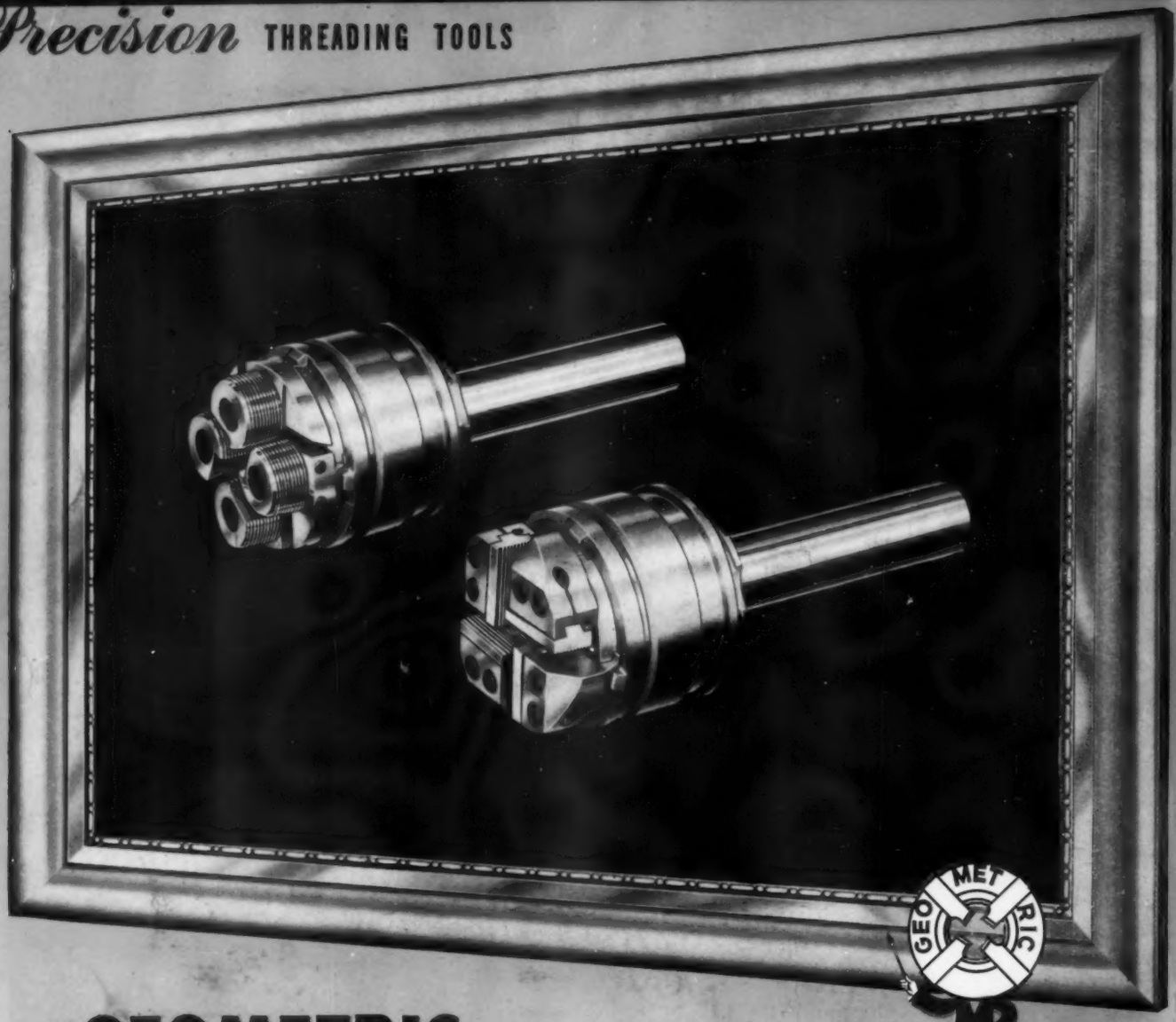
World's Leading

THREADING TOOLS

When you buy GTD "Greenfield", you get a quality of product that comes from the world's largest, most modern threading tool plant and its research staff of threading engineers – PLUS SERVICE from the leading distributors and GTD "Greenfield's" field men in every industrial center.

GREENFIELD TAP and DIE CORPORATION GREENFIELD, MASSACHUSETTS

Precision THREADING TOOLS



GEOMETRIC STYLE TR ROTARY

Combination Tangent and Circular Chaser DIE HEADS

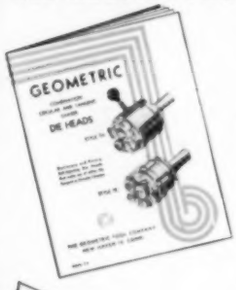
Unique Design Saves Time and Money

For those threading jobs that call for the use of either tangent or circular type chasers, this GEOMETRIC COMBINATION DIE HEAD offers several definite advantages.

First, it will accommodate Chaser Holders for both the tangent or circular type of chaser. *Second,* it has improvements in design which greatly lessen expensive down time for grinding and re-setting. It also permits threading with the greater part of the threaded surface of the chaser. Chasers and Chaser Holders can be removed without taking the head from the machine, which further reduces down time.

Finally, because of their small diameters and short over-all lengths these GEOMETRIC COMBINATION DIE HEADS will fit into the most limited spaces on any machine. Rotary Type Style TR and Stationary Type Style TH Combination Die Heads are made in three sizes with a cutting range of diameters from ⅛ to 1½ inches and are equipped with "Tangemetric" or "Circometric" Chasers and Holders, as specified. ***For complete details about the GEOMETRIC COMBINATION DIE HEADS, send today for the free bulletin on this line.***

USE COUPON FOR FREE INFORMATIVE BULLETIN NO. T-3



THE GEOMETRIC TOOL COMPANY
7 Valley Street
New Haven 15, Connecticut

Please rush me a copy of Bulletin No. T-3 which describes in detail the many advantages of the Geometric Combination Die Heads.

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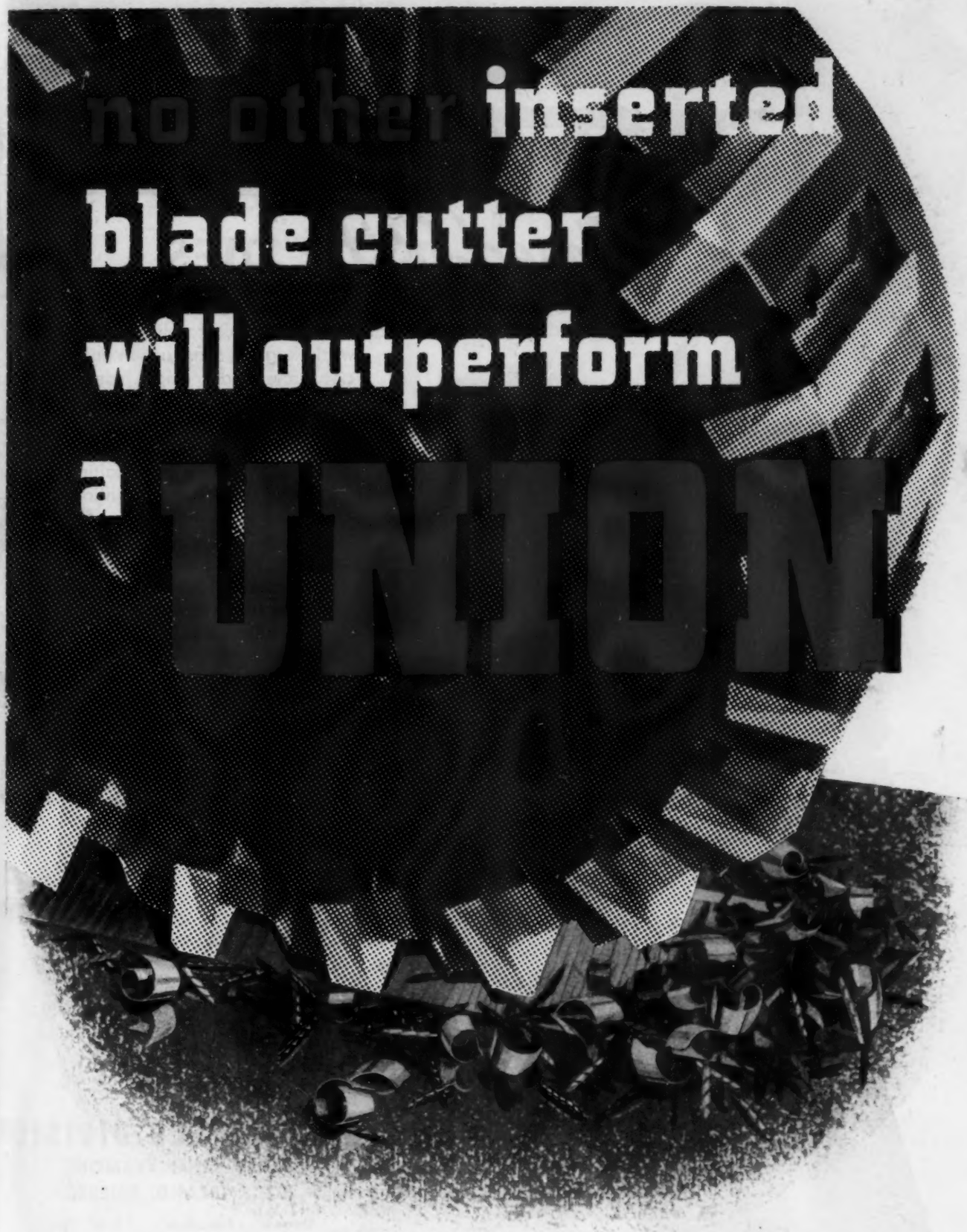

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UNION TWIST DRILL COMPANY, ATHOL, MASSACHUSETTS

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BUTTERFIELD Divisions, Derby Line, Vt., Rock Island, Quebec. Manufacturers of Taps, Dies, Screw Plates.

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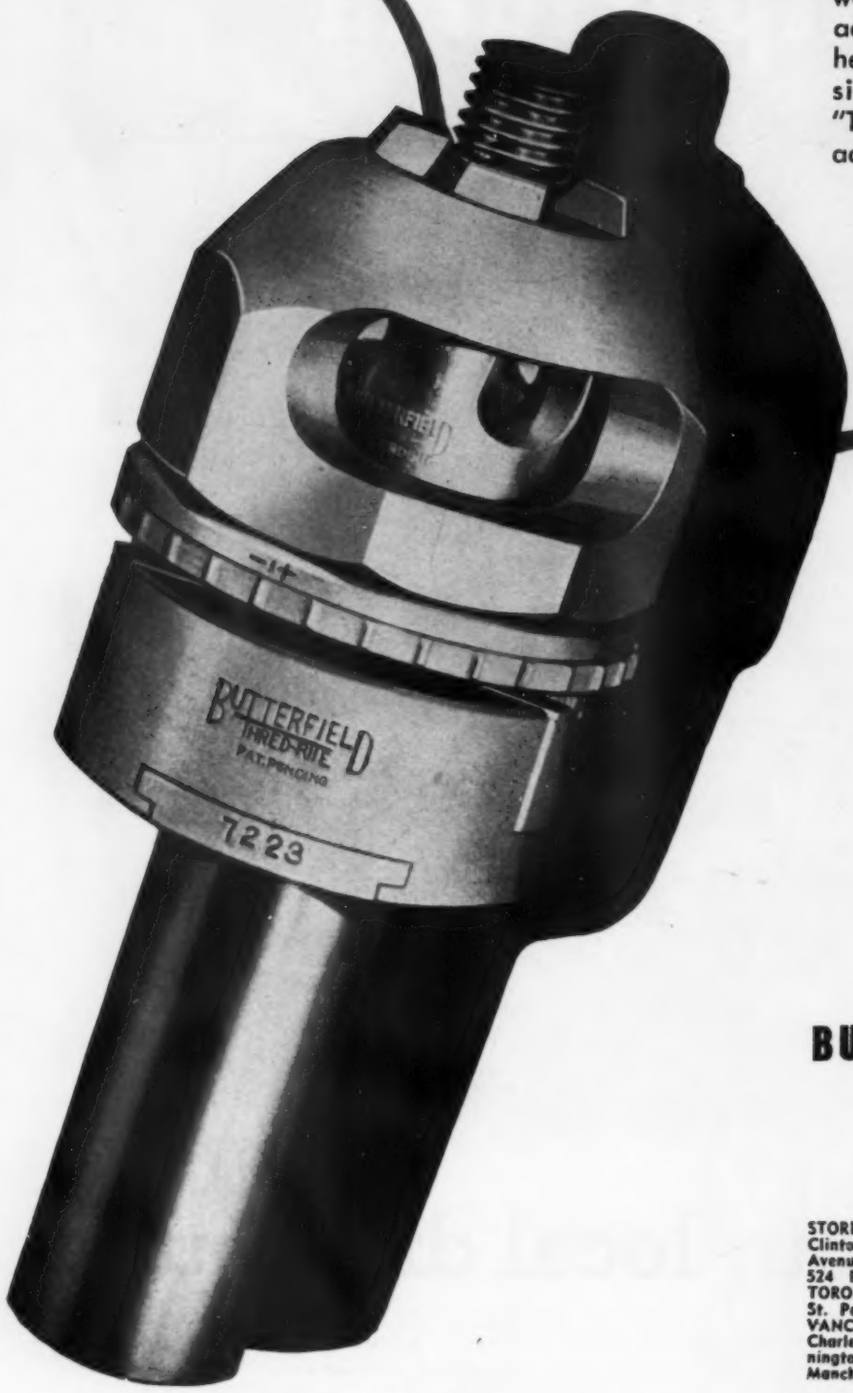
"Thred-Rite" DIES

Graduated micrometer lock nut adjustment can be set to split thousandths! Full floating design assures accurately centered work! Rugged construction holds accuracy under high speed, heavy duty operation! Use the simple, accurate, efficient "Thred-Rite" Die on jobs where accuracy must be maintained with minimum attention. They are built in a full range of standard sizes, with NC or NF threads, in carbon or high speed steel. Get full details from your nearest Butterfield store.



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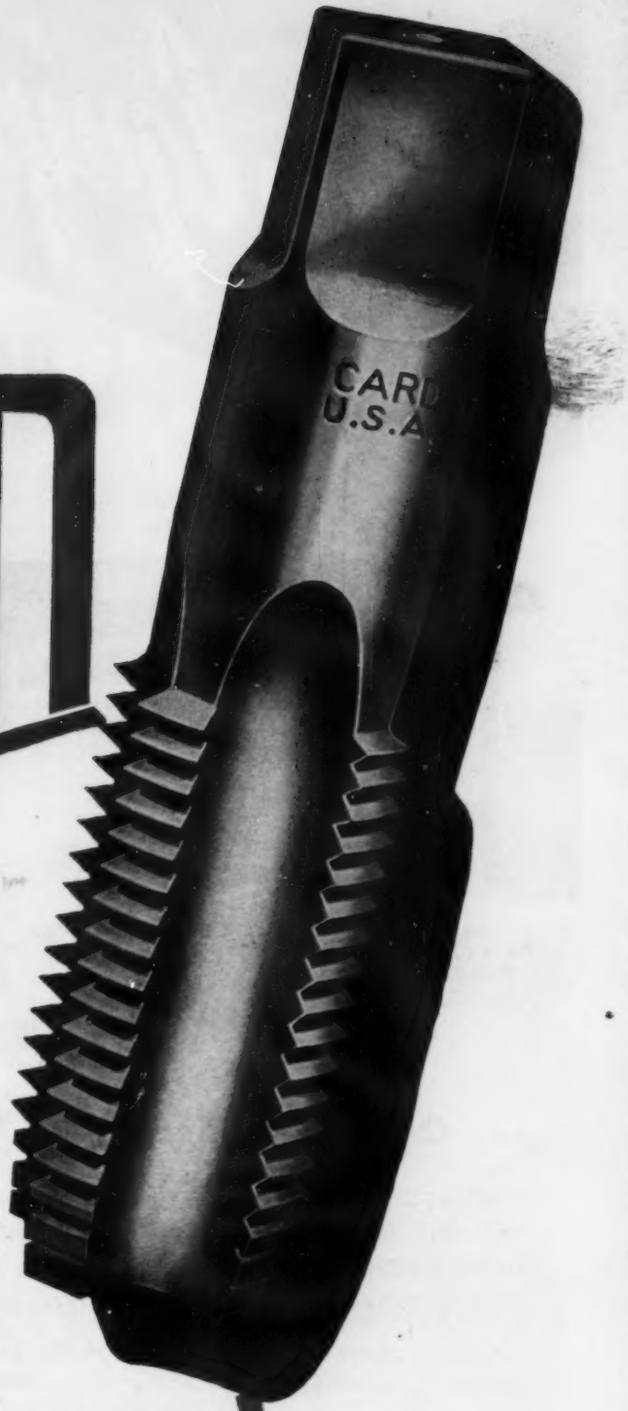

THE RIGHT ANSWER TO EVERY TAPPING PROBLEM

More and more tap users are specifying CARD for every tapping job. They know that it pays to go to a specialist. They know that they can get the right answer to every tapping problem from this single, convenient, complete source of supply. They know that—in the test of service—Card Taps have given them long runs of threads, high output on all types of materials and under all conditions, and precision results that satisfy their most exacting demands.

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Shop Equipment of Steel

BUY HALLOWELL

Fig. 732
Pat. & Pats. Pending
Drawer is extra

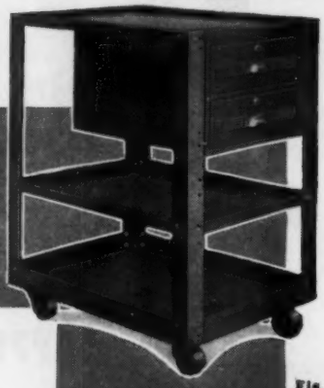


Fig. 1855
"Hallowell"
TOOL STAND
of Steel may
be had with
rubber-tired
casters.

Fig. 2197
"Hallowell"
FOREMAN'S
DESK
of Steel.

. . . OF WELDED STEEL FOR LONG SERVICE

"Hallowell" Ready-Made Shop Equipment of Steel is designed and built for *utility, long service, hard wear* and *comfort*. The line comprises: WORK-BENCHES, TOOL STANDS, FOREMAN'S DESKS, CHAIRS, STOOLS AND TRUCKS—all in a wide variety of styles and sizes.

Lack of space prohibits a full description of "Hallowell" Equipment. Suffice it, therefore, to mention the "Hallowell" WORK-BENCH of Steel with flared feet . . . stands firm *without* costly bolting to the floor . . . is made in a number of standard heights, widths and lengths. TOOL STANDS and FOREMAN'S DESKS—each of steel. Be sure to ask for your copy of the "Hallowell" Equipment Catalog . . . it's complete and absolutely necessary when you're ordering "Hallowell" Shop Equipment. Deliveries and Prices are very attractive.

Ask for the name and address of your nearest "Hallowell" Industrial Distributor

OVER 45 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA., BOX 4 • BRANCHES: BOSTON • CHICAGO • DETROIT • INDIANAPOLIS • ST. LOUIS • SAN FRANCISCO

use a GE motor starter

These G-E combination starters give your motors money-saving protection—three ways. Providing short circuit, overload and undervoltage protection, they save you installation costs because fuses, disconnect switch and magnetic starter are all in one unit. Whatever your operating condition, there's a combination starter to do the job. See bulletin GEA-3571A for details.

MORE G-E STARTERS General Electric has a complete line of motor starters, manual or magnetic, full- or reduced-voltage, reversing or nonreversing from 1 to 1000 horsepower ratings. All G-E starters come in a variety of enclosures. For more information on all G-E starters, including those shown below, ask your nearest G-E office for catalog GEA-642. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

CR1061 G.E.'s smallest, most inexpensive starter for manual control of single-phase, ¾-hp motors.

CR1062 Sturdy, low-priced starter for manual control of single and three-phase motors up to 7½ hp.

CR1034 A simple, manual, reduced-voltage starter for preventing voltage dips and shock from too sudden starting of motors ranging from 5 to 200 hp (four sizes).

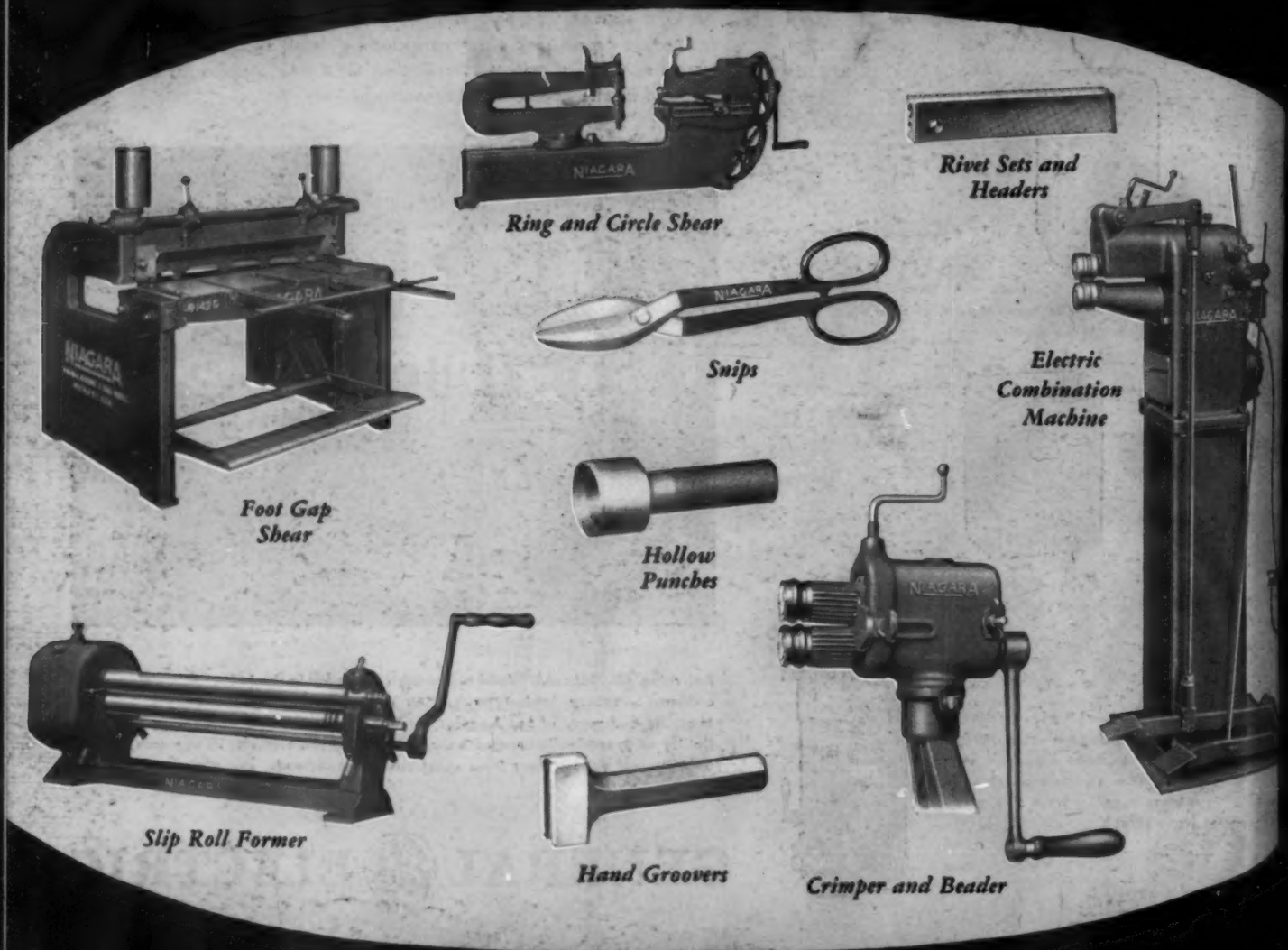
Polishing off "Mix-All" food and drink containers is the job of this unique, automatic, rotary table-type buffing machine built by the Square Deal Machine Company of Los Angeles for Western Die Casting Company. Continuity of operation is assured because combination starters, in one compact unit, protect your motors from short circuits, overloads, and undervoltages.

GENERAL ELECTRIC

NIAGA

Everything from

TINNERS TOOLS *to* P



NIAGARA MACHINE AND TOOL WORKS, BUFFALO 11, N.Y. DIS

NIAGARA

POWER PRESSES *and* SHEARS

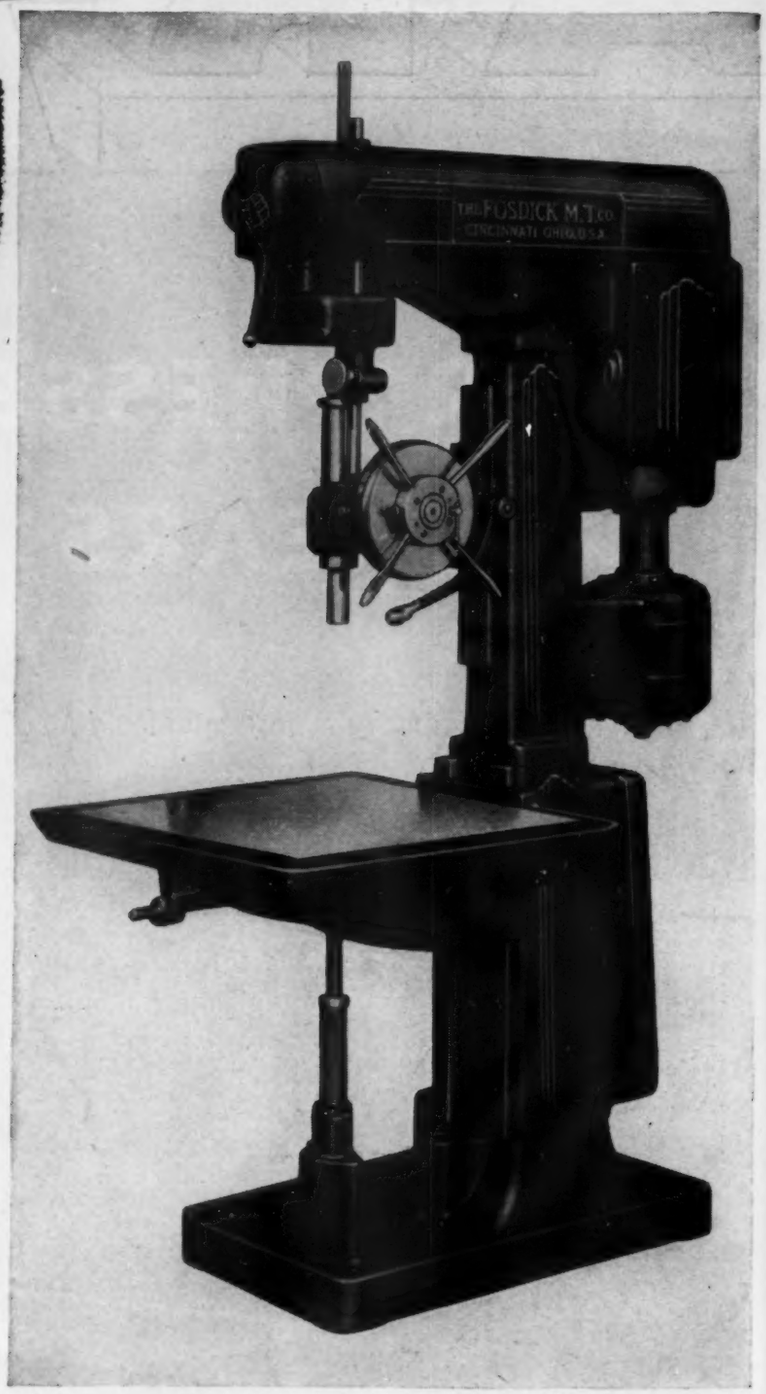
● Niagara offers America's most complete line of tinner's tools, machines, power presses and shears for production and maintenance. Illustrations on these pages show how they range from items as simple as a rivet set up to heavy presses and power squaring shears. Whether you require hand, foot or power operated equipment, — you get the best when you specify Niagara. Write for catalogs.

Y. DISTRICT OFFICES: • NEW YORK • CLEVELAND • DETROIT

FOR HIGH PRODUCTION OF SMALL DIAMETER HOLES

FOSDICK

4-BM and 5-BM SENSITIVE DRILLS



Here is a machine ideally suited to drilling and tapping operations up to 1½" diameter holes.

Single speed motors with complete controls are furnished with the machine. To reverse spindle for tapping, an extra contactor is added to the controller. Operation is simple—forward movement of the hand wheel causes spindle to run in proper direction and reversing hand wheel causes spindle to reverse.

The drive to spindle is through Vee belts. All revolving shafts are mounted on anti-friction bearings and gears slide on splined shafts.

The machines are furnished with box or round columns and in any number of spindles up to six.

This line of Fosdick drills offers exceptional economy in drilling—reaming—facing and tapping operations on work within its capacity. Write for complete details—fully covered in Fosdick H. S. Bulletin H. S. M.

FOSDICK MACHINE TOOL *Company*
CINCINNATI 23, OHIO

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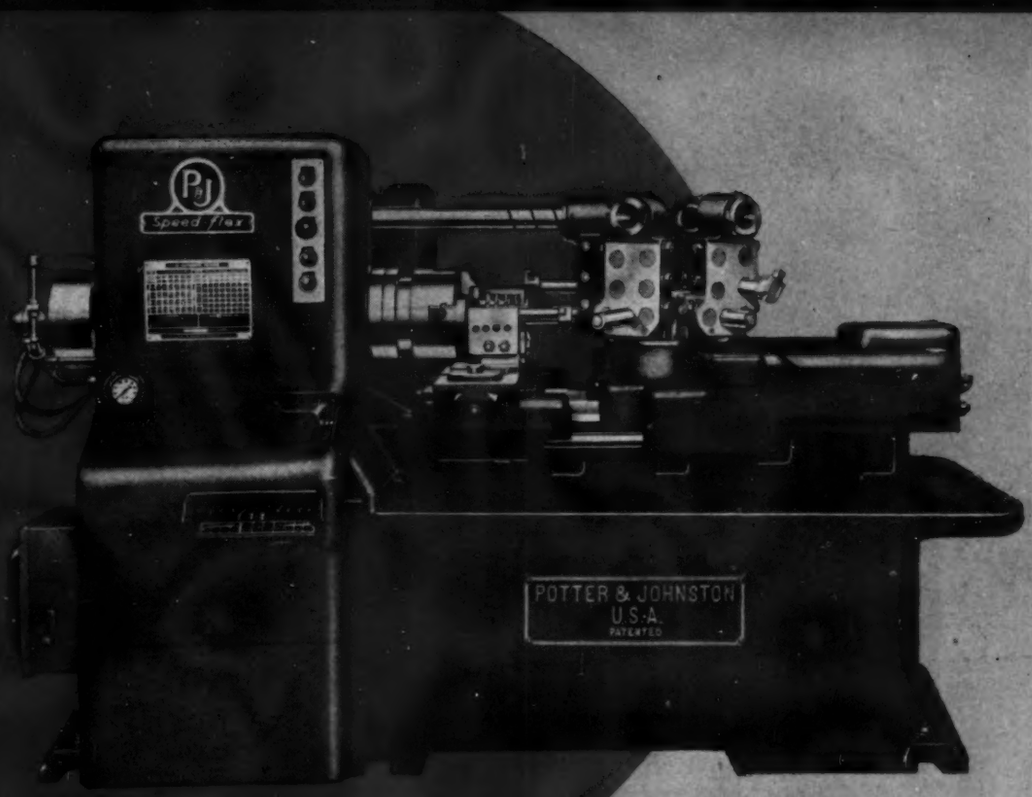


FAST, *automatic, low-cost machining of a wide range of small parts is made possible on the*

NEW P & J 3 U SPEED-FLEX

This automatic turret lathe . . . the smallest in the P&J line . . . is a high speed machine capable of machining small castings or forgings up to 6" diameter.

Its versatility and capacity are such that it will handle small work ordinarily requiring several machines. Furthermore, its speed and flexibility, together with ease of control, result in definite savings in production costs.

Four automatic changes of spindle speed as well as three automatic changes of feed are provided. Multiple disc clutches under electro-pneumatic control handle speed and feed changes.

Potter & Johnston Methods Engineers are available to offer recommendations for handling your small duplicate work on this machine.

Condensed Specifications

Optional Spindle Speed Range: 36 to 711 rpm; 73 to 1445 rpm.
Cross Slide Travel: 2½" front; 2⅞" rear
Swing over Cross Slide: 9½"
Turret Faces: 6
Turret Feed 4½"
Floor Space: 16 square feet
Standard Spindle Speed Range: 73 to 1445 rpm

For more complete information send for catalogue12-25a

OTHER AUTOMATIC TURRET LATHES

Model 4D
(Swing over bed: 21")

Model 5D
(Swing over bed: 25")

Model 5D2
(2spindle) (Swing over bed. 21½", 23", 28")

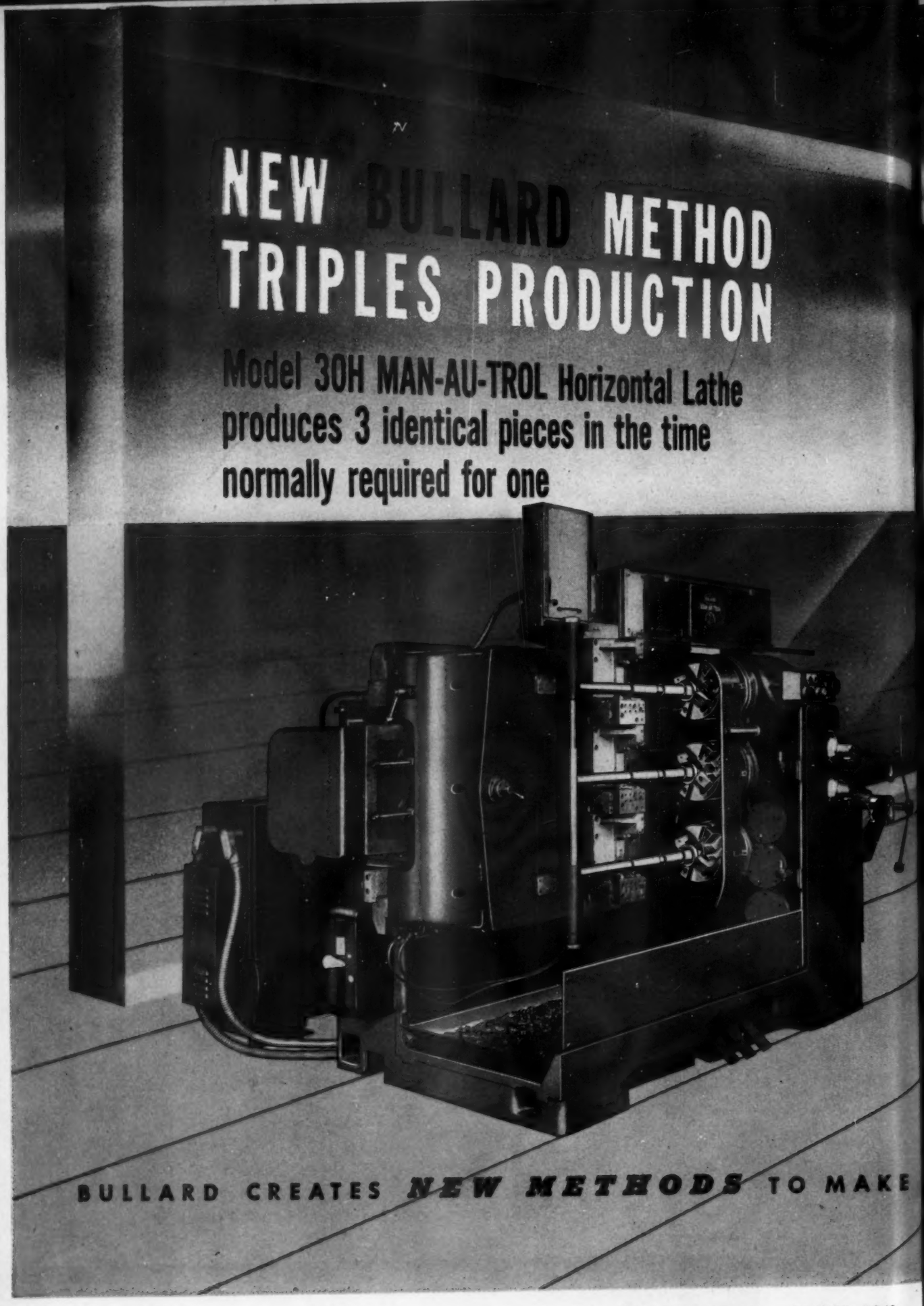
Model 6DRE
(Swing over bed: 34")

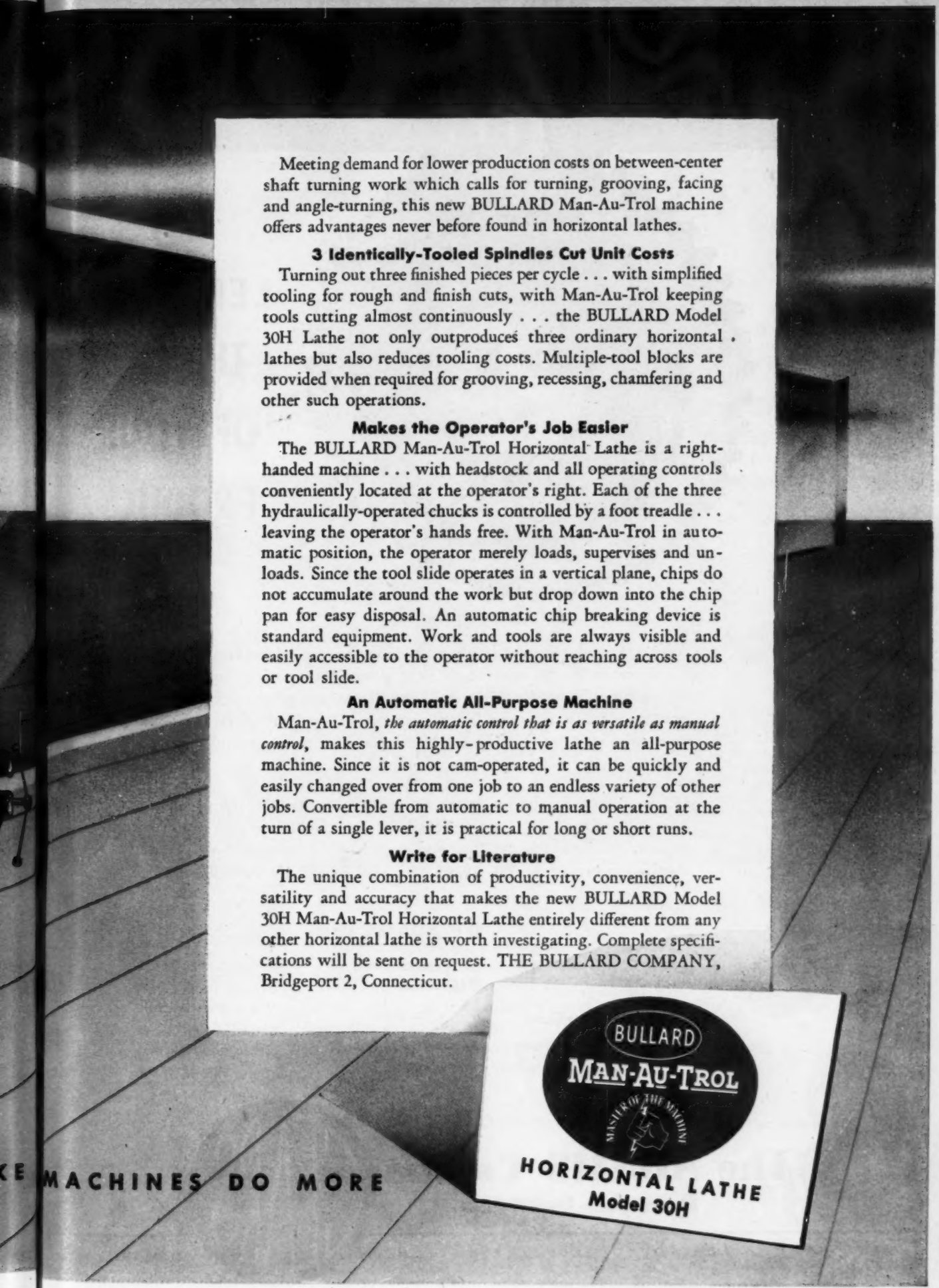
Model 6DS
(Swing over bed: 34" and 40")

Model 8DT
(Swing over bed: 36")

Pioneer Manufacturer of Automatic Turret Lathes

POTTER & JOHNSTON MACHINE CO
PAWTUCKET, R.I.


NEW BULLARD METHOD
TRIPLES PRODUCTION
Model 30H MAN-AU-TROL Horizontal Lathe
produces 3 identical pieces in the time
normally required for one
BULLARD CREATES NEW METHODS TO MAKE



Meeting demand for lower production costs on between-center shaft turning work which calls for turning, grooving, facing and angle-turning, this new BULLARD Man-Au-Trol machine offers advantages never before found in horizontal lathes.

3 Identically-Tooled Spindles Cut Unit Costs

Turning out three finished pieces per cycle . . . with simplified tooling for rough and finish cuts, with Man-Au-Trol keeping tools cutting almost continuously . . . the BULLARD Model 30H Lathe not only outproduces three ordinary horizontal lathes but also reduces tooling costs. Multiple-tool blocks are provided when required for grooving, recessing, chamfering and other such operations.

Makes the Operator's Job Easier

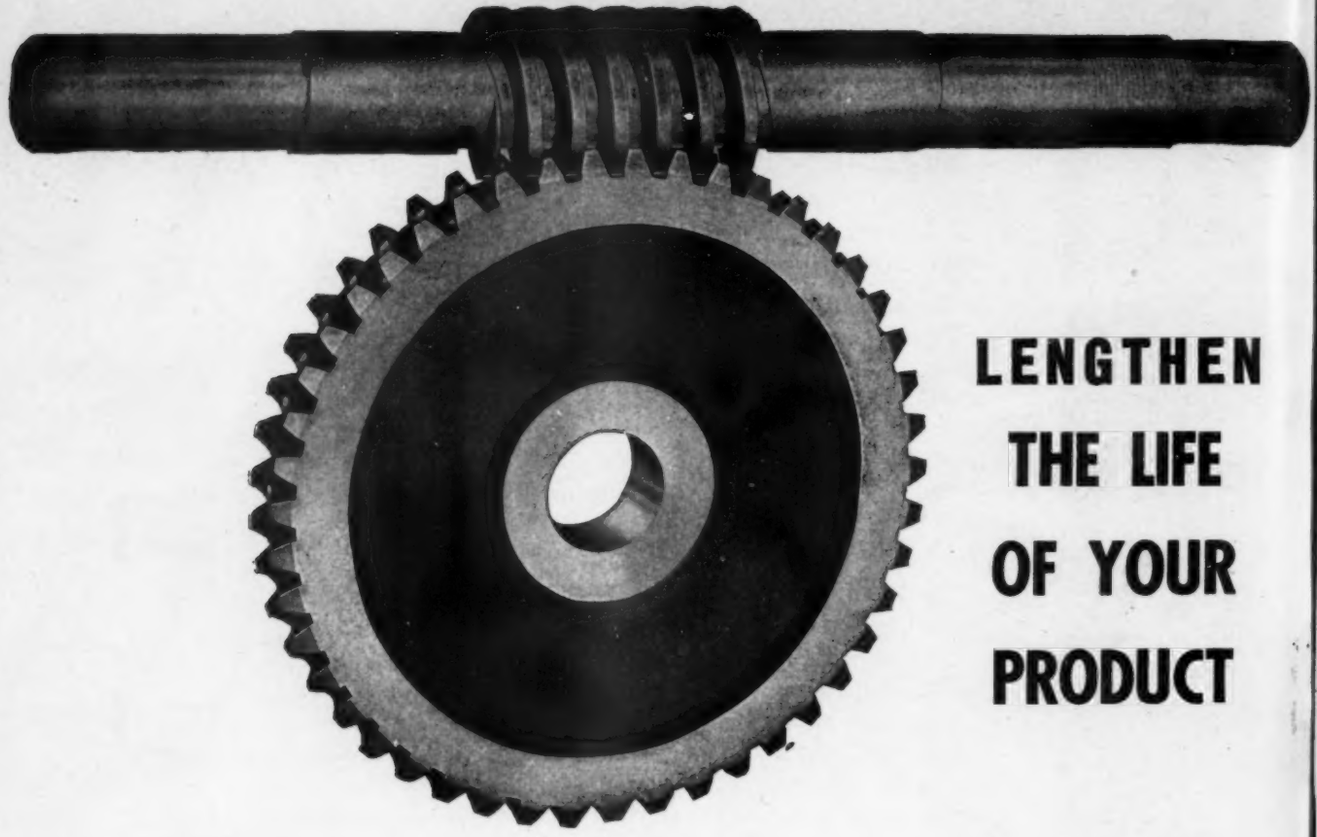
The BULLARD Man-Au-Trol Horizontal Lathe is a right-handed machine . . . with headstock and all operating controls conveniently located at the operator's right. Each of the three hydraulically-operated chucks is controlled by a foot treadle . . . leaving the operator's hands free. With Man-Au-Trol in automatic position, the operator merely loads, supervises and unloads. Since the tool slide operates in a vertical plane, chips do not accumulate around the work but drop down into the chip pan for easy disposal. An automatic chip breaking device is standard equipment. Work and tools are always visible and easily accessible to the operator without reaching across tools or tool slide.

An Automatic All-Purpose Machine

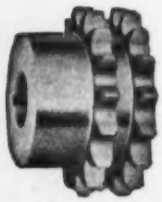
Man-Au-Trol, *the automatic control that is as versatile as manual control*, makes this highly-productive lathe an all-purpose machine. Since it is not cam-operated, it can be quickly and easily changed over from one job to an endless variety of other jobs. Convertible from automatic to manual operation at the turn of a single lever, it is practical for long or short runs.

Write for Literature

The unique combination of productivity, convenience, versatility and accuracy that makes the new BULLARD Model 30H Man-Au-Trol Horizontal Lathe entirely different from any other horizontal lathe is worth investigating. Complete specifications will be sent on request. THE BULLARD COMPANY, Bridgeport 2, Connecticut.



LENGTHEN THE LIFE OF YOUR PRODUCT



You'll get real customer satisfaction when you use Adams Gears . . . they're custom-built for the smooth, efficient power transmission and proper load distribution that add stability and long life to your product. High performance standards are assured by the accuracy of specified tolerances, scientific heat treatment for working hardness and close manufacturing and quality control.

When you standardize on Adams Gears for your product, you get more economical production. Gears designed for the specific job and built exactly to your specifications save time and money on the asembly floor. Write for detailed information. **THE ADAMS CO., 1942 BRIDGE ST., DUBUQUE, IOWA.**

the ADAMS line

Spur Gears
Helical Gears
Bevel and Miter Gears
Worms and Worm Gears
Sprockets
Internal Gears (Spur and Helical)
Ratchets
Splined Shafts
Racks
Lead and Feed Screws
Ground Tooth Gears (Spur and Helical)
Shaved Tooth Gears (Spur and Helical)
Ground Thread Worms

The ADAMS Compa

Dubuque, Iowa, U. S. A.

GEARS

FINE GEARS MADE TO YOUR SPECIFICATIONS . . . ESTABLISHED 1883

if

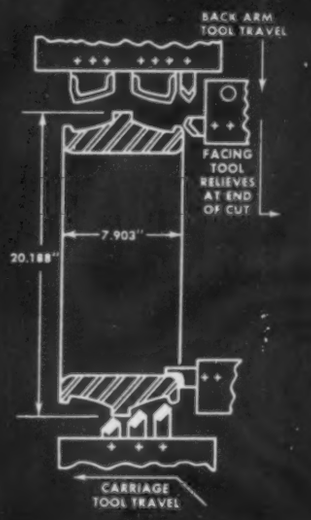
YOU CAN CUT YOUR TURNING COSTS

your lathes have the Power, Rigidity and Spindle Speeds to use Carbide Tools effectively.

for instance . . .

Here's a revolutionary example of power turning on a husky Roller Bearing Inner Race. The machine is the New Jones & Lamson 28" Fay Automatic Lathe.

A total of 98 POUNDS OF SAE 52100 STEEL is removed from the forging in only 8 MINUTES. Note the power requirements for the two 2-7/8" forming cuts at 330 SFM and .00375 Feed. The load created by the two carbide tipped form tools is IN EXCESS OF 100 HORSEPOWER!



Manufacturer of: Universal Turret Lathes · Fay Automatic Lathes · Automatic Double-End Milling and Centering Machines · Automatic Thread Grinders · Optical Comparators · Automatic Opening Threading Dies and Chasers · Ground Thread Flat Rolling Dies

YOU CANNOT COMPETE with production like this with machines less powerful, less rigid.
Jones & Lamson Lathes guarantee your investment.
***They anticipate* the future in metal turning.**
***They are built* with great reserves of ruggedness.**
***They are powered* to meet even more than today's requirements for the effective use of carbide tools.**
Let a Jones & Lamson engineer study your turning operations. He will be able to make recommendations that will improve your profit picture. He has for others.

JONES & LAMSON MACHINE COMPANY, Springfield, Vermont, U. S. A.

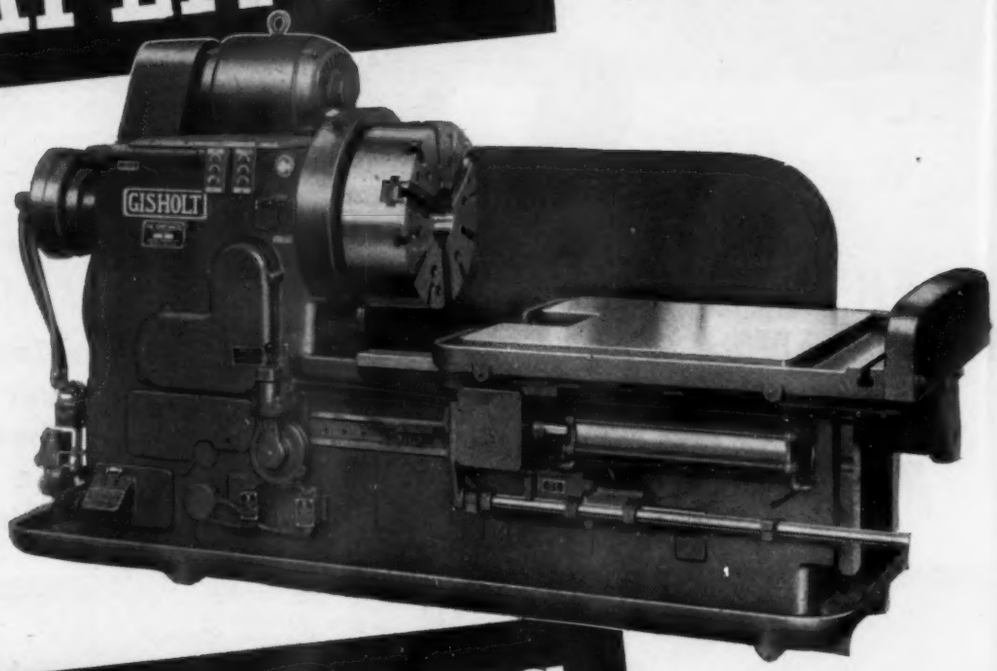
Jones & Lamson Lathes

ARE POWERED FOR CARBIDE

SIMPLIFY

your
"special" jobs

with the
GISHOLT



SIMPLIMATIC

Where you have sufficient volume for automatic machining, you, too, may find the low-cost answer in the Simplimatic.

For here's such adaptability in simple, basic design that it gives you an individualized machine to handle many diverse and unusual problems. Here are some of the reasons:

1. *A wide variety of slide positions is possible on the large platen table for straight and angular feeds.*
2. *Tailstock, hand or pneumatically operated, can be mounted on platen table for between-centers work.*
3. *Linkage arrangement between slides permits spherical boring in conjunction with facing and turning.*
4. *Back facing or back boring through the spindle can often be combined with other cuts in a single operation.*
5. *Vertical head can be used where it provides more favorable working position, with slides cammed individually or entire head cammed as a unit.*
6. *Simultaneous double end machining is possible with full utilization of the base machine.*

Now, with higher costs for labor and materials, investigate the economies the Simplimatic can bring you. Get the facts.

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts.*

GISHOLT MACHINE COMPANY

Madison 3 • Wisconsin

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SUPERFINISHERS • SPECIAL MACHINES

NEW IMPACT

STRONGER! TOUGHER!

WILLIAMS SUPERSOCKETS

● Today's powerful pneumatic or electric Impact Wrenches deliver a constant series of high torque rotary impacts. To withstand this terrific day in and day out punishment impact sockets must be extra strong... extra tough. Williams Impact Supersockets are just that. Made of super tough alloy steel and specially heat treated, they incorporate all the refinements of years of impact wrench manufacturing and usage.

Williams Impact Supersockets are adaptable to *all* socket locking methods and exceptionally close tolerances are maintained through accurate machining of the nut and square drive openings. This assures less impact torque loss, less wear of the socket itself and consequently, greater operating efficiency.

Remember, standard mechanics hand sockets and power type sockets designed for use with powered, clutch type nut setters are not recommended for impact wrenches. Impact wrench manufacturers recommend the specially designed heavy-duty impact socket for use with their tools.

Impact Supersockets are available in seven Drive sizes, 1/4", 3/8", 1/2", 5/8", 3/4", 1" and 1-1/2", with Hex openings from 3/16" to 3-1/2". Actually, over 100 different sockets. Can be used with power nut runners as well as impact wrenches.

WILLIAMS

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OPEN END, BOX, ADJUSTABLE & RATCHET WRENCHES; DETACHABLE SOCKETS & SETS; IMPACT SOCKETS; TOOL HOLDERS; LATHE DOGS; "C" CLAMPS; CHAIN PIPE TONGS & VISES; FLANGE JACKS; PLIERS; SCREWDRIVERS; PUNCHES & CHISELS; SOFT FACED "NUPLAPLEX" TIPPED HAMMERS; HOIST HOOKS; EYE BOLTS; ROD ENDS; CRANK & BALANCE HANDLES; THUMB SCREWS & NUTS.

J. H. WILLIAMS & CO., BUFFALO 7, N. Y. *Distributors Everywhere*

SPRINGFIELD
Geared Head
LATHES
—are the result of more than 60 years of constant development based upon actual shop experience and are designed and built throughout to meet the exacting demands of modern manufacturing techniques.
No finer lathes exist today. Not only is there constant improvement in design and performance, but every detail of manufacture must conform to the highest precision standards. The gears of the Headstock are typical of these standards. Every gear is forged from the best grade of chrome—Molybdenum steel, heat-treated, and the teeth GROUND to close tolerances under the watchful guidance of experienced craftsmen to eliminate chatter, insure highest speeds and maximum performance.
THE SPRINGFIELD MACHINE TOOL COMPANY
SPRINGFIELD, OHIO, U. S. A.
GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 400 WEST MADISON ST., CHICAGO 6
Exclusive Representatives in All Principal Cities

NEW ADDITIONS

PERMANENT MAGNET CHUCKS

NOW...NEW SMALL SIZES—NEW FEATURES

These new models have all the advantages of other B & S Permanent Magnet Chucks... ready portability, absence of wires and auxiliary generators, freedom from heating with attendant distortion of work, strong holding power—retained indefinitely. All, suitable for wet and dry grinding. For sale only in the United States of America and its Territories. For complete information write: Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

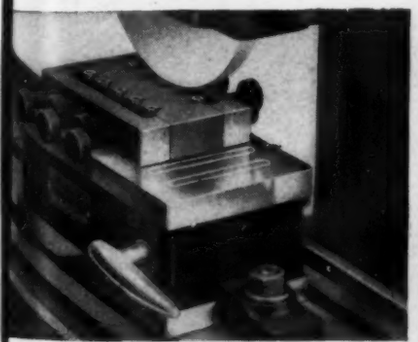
No. 408 Rectangular Model, with its small working surface (4" x 8"), is specially suited for use on small surface grinding machines, bench grinders and for bench work. Pole spacers are closer than on other rectangular models to permit holding smaller pieces.

No. 412 Two-Line Rectangular Model, has working surface, 4" x 12" and two line pole spacers. Useful for grinding rows of small parts as well as intermediate and large sizes. Many types of work may be laid end-to-end over line spacers. Packing strips not required.

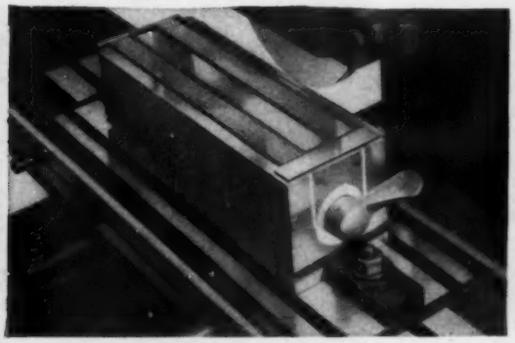
No. 5R Rotary Model, is the smallest B & S rotary model. Holds work from ¾" to 5" in diam. Control ring permits control of holding strength from any position in which chuck stops.

No. 7R Rotary Model, next smallest rotary model, holds work from 1 3/16" to 7" in diam. The amount of energy or holding power in the face can be controlled by giving the operating handle a part turn, thus permitting work to be moved or tapped into position and centered accurately.

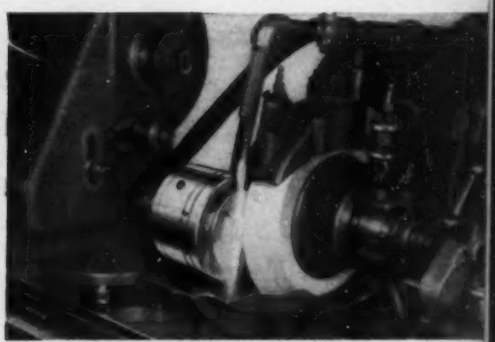
We urge buying through the distributor



Grinding bushing ends on No. 408 Chuck



Group grinding on No. 412 Chuck



Disc grinding of pump part on No. 5R Chuck

BROWN & SHARPE B·S

DANLY STRAIGHT-SI

THE RUGGED strength and precision construction of Danly Presses is a guarantee of greater production and continuing accuracy of stampings.

A circulating, filtered lubrication system keeps working parts under direct controlled lubrication.

The Danly Air Friction clutch is so designed that most of the moving parts rotate with the flywheel at all times, materially reducing the energy required for starting and stopping. Fully ventilated for cool operation, this clutch has, in its design, the charac-

1

2

1 POINT PRESSES

The 500 ton Eccentric Gear Press (*above*) was designed for a job which required a comparatively high tonnage exerted over a small area.

The heavy construction and massive rigidity of this press insure the accuracy of stamped parts, the safety of the dies. Danly single point presses are standard from 100 to 600 tons capacity.

2 POINT PRESSES

Typical of the entire line of Eccentric Gear Presses, the cleanly designed two point 400 ton press (*center*) is suitable for right to left or front to back feeding. Absence of overhanging machinery leaves plenty of headroom for feeding and scrap removal. 2 point presses are standard from 100 to 1200 tons capacity.

4 POINT PRESSES

The 1000 ton 4 point press (*right*) has a slide connection or suspension point at each corner of the slide. This method of suspension keeps the slide and bed in parallel even when off center dies are consistently used. Danly 4 point presses are standard from 100 to 2000 tons capacity.

Write for circular on Danly Eccentric Gear Straight-Side Presses

DANLY MACHINE SPECIALTIES, INC., 100 S

...SIDE PRESSES HAVE...

...eristics that make for long life and low maintenance. Notice the rugged massiveness of the presses shown below—the modern enclosed construction that increases safety and operator acceptance.

Men who work with presses—supervisors, maintenance men, and operators alike—will find in the Danly Press, the features they want for better, faster press operation—the features that result in greater volume production of more accurate stampings at lower unit cost!

1 Sound, Clean Welding
2 Stress Relieved Weldments
3 Precision Machining
4 Rigid Enclosed Construction
5 Accurate Alignment
6 Circulating Filtered Lubrication System
7 Disc-Type Clutch and Drum Brake
8 Electrical Controlling

THESE FEATURES GIVE YOU—

1 Accurate Stampings
2 Trouble-free Operation
3 Less Tool Wear
4 Ease of Operation
5 Safety
6 Accessibility
7 Simplified Maintenance

Result—

Greater volume production of more accurate stampings at lower unit cost.

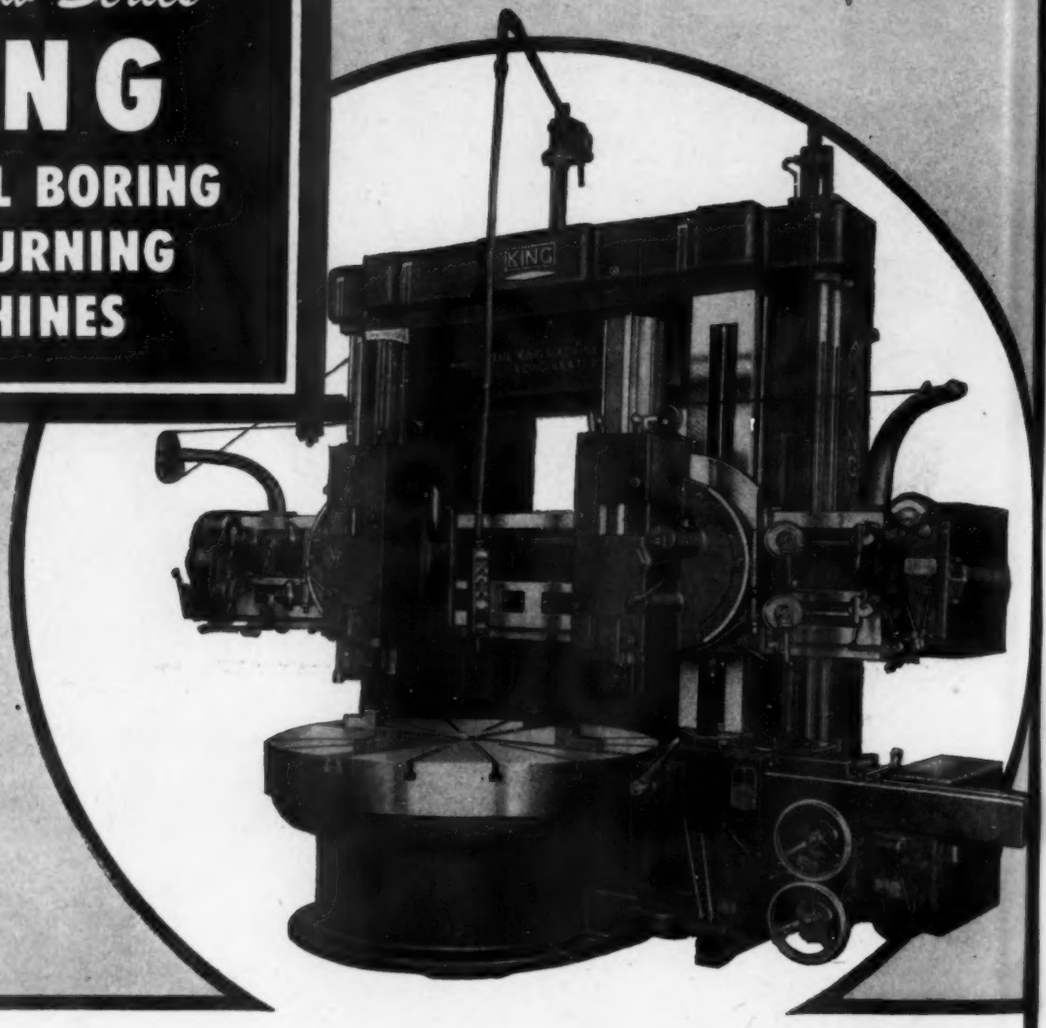
...NC., 100 SOUTH 52ND AVENUE • CHICAGO 50, ILLINOIS

CARBIDE TOOLS

present no problems with New Series

KING

VERTICAL BORING AND TURNING MACHINES



The chief reason for the successful use of high speed carbide tools on the new Series KING Machines stems from the increased weight throughout and the resultant rigidity of its sturdy construction.

This is clearly indicated in the massive rectangular type ram heads—saddle for ram head square locked and fitted with four tapered gibs for accurate adjustment—and the heavy tie plate across the swivel.

Add to this the ease and convenience of control afforded by location of all control levers at the front of the machine within easy reach of operator at all times.

All of which adds up to greater production and lower costs on your vertical boring and turning operations with a new series KING.

Available in a full range of sizes from 30" to 144". Write for details.

American Steel Foundries

KING MACHINE TOOL DIV.
CINCINNATI 29, OHIO

Builders of Vertical Boring and Turning Machines and Sebastian Lathes

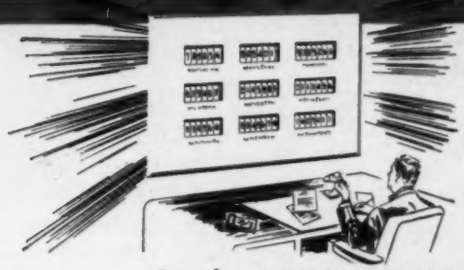
ELECTRICAL CONTACTOR INSTALLED ON MACHINE

Count it here

in your Plant...

Read it here

in your Office!



Get the ADVANTAGES of Ready VEEDER-READINGS ...with Remote-Indicating Magnetic Counters

- Up-to-the-minute figures on machine-production can be flashed from plant to office . . . *a few feet or many miles.*
- Any number of counters can be mounted on a central panel.
- *Direct* VEEDER-READINGS give a plant-wide picture of production efficiency at all times . . . *at a glance.*
- Lagging machines can be spotted *instantly* and conditions corrected immediately.
- Counters are easy to install and connect to any AC or DC source.

This Small Reset Magnetic Counter is one of scores of types of Veeder-Root Counting and Computing Devices, standard and special, for electrical, mechanical, and manual operation. Write for 8-page Condensed Catalog.

Veeder-Root

INCORPORATED

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Counting Devices

ATTACH THEM TO YOUR PRESENT MACHINES . . . BUILD THEM INTO YOUR NEW MACHINES

The operator does not stretch

These four pictures illustrate a common factor—easy, handy controls for the operator. The Reed Roller Bit Company, Houston, Texas, tells us of the ease, accuracy and trouble-free performance of their Cincinnati Bickford Super Service Radials.

Picture No. 1 shows slush holes ½" diameter by 4" being drilled in K K Core Bit Heads—at 180 per hour.

Cincinnati Bickford Super Service Radial Drills have brought a high production rate and economical operation in the shop.

Write for Bulletin No. R-21B for complete description of these productive tools.

THE CINCINNATI BICKFORD TOOL CO.
RADIAL AND UPRIGHT DRILLING MACHINES
SUPER SERVICE
Radials 7½" dia. col., 2½' arm, to 26" dia. col., 12' arm.
General purpose Uprights, 21" to 28" sizes.
Production Uprights, 21" to 28".
Jig Borers, Portable Horizontals, Spacing Table Machines.

Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

NOT A BRAND,

BUT A BRAND PROTECTOR

"CIRCLED R" ®

TIMKEN ®

It tells the world that "TIMKEN" is registered as a trade-mark in the United States Patent Office and cannot lawfully be used to designate products other than those manufactured by The Timken Roller Bearing Company — Timken Tapered Roller Bearings, Timken Alloy Steels, Timken Seamless Steel Tubing and Timken Rock Bits.

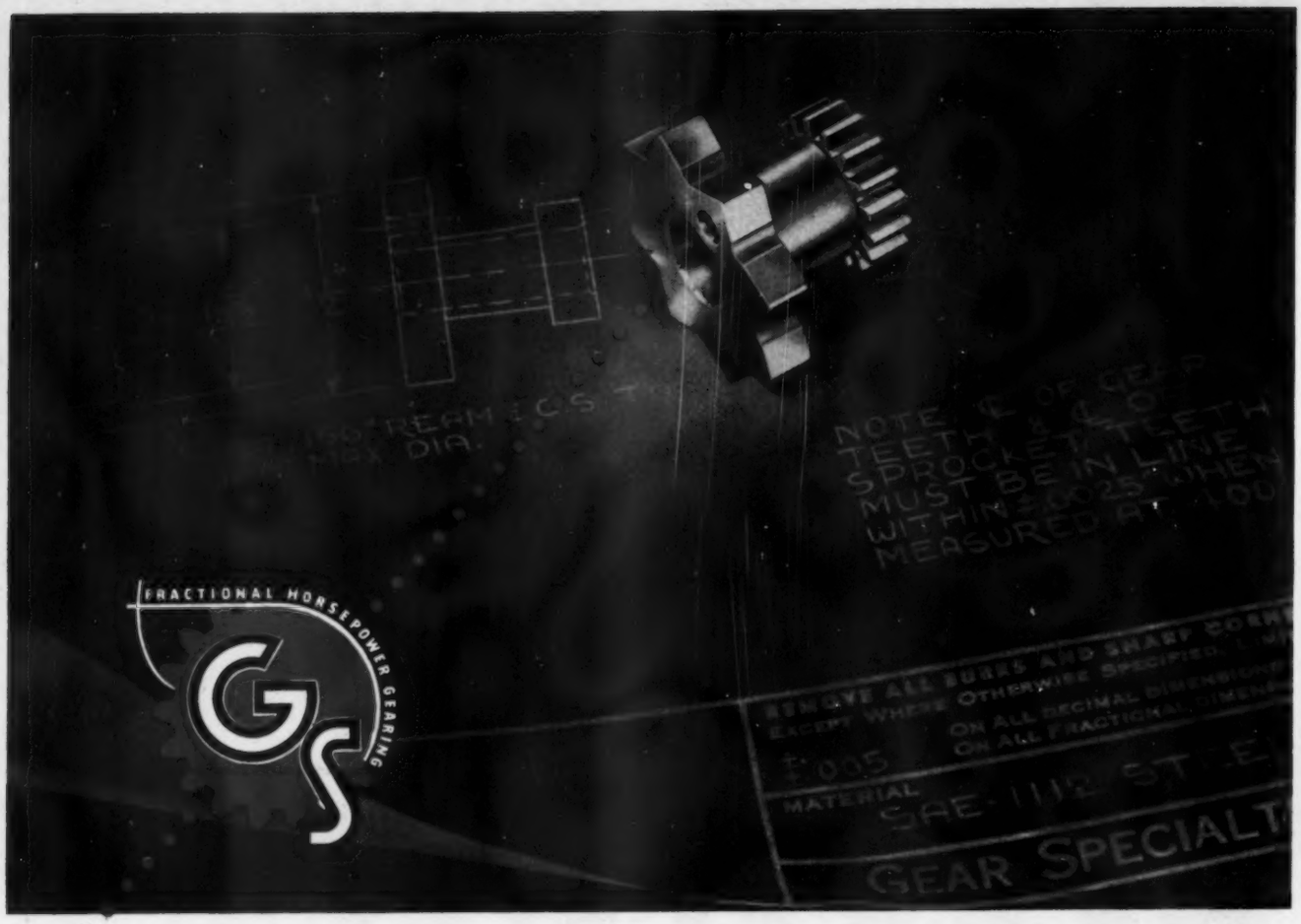
The trade-mark "TIMKEN" is the buyer's assurance of the finest products in their respective fields. Look for it. The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ⊖ AND THRUST →⊖← LOADS OR ANY COMBINATION ✳



what this symbol means to you

● We expect you to take it for granted that the G-S trademark symbolizes workmanship of an unusually high degree of perfection in the manufacture of Fractional Horsepower Gears. However, our service goes far beyond that. Our engineers, for instance, do not permit worn-out conceptions to restrict their creative thinking. Many knotty Small Gear problems have been solved, here, in extremely functional, *new* applications. Your inquiries are invited if you wish to assure smoother, quieter, more dependable performance of the *Small* Gears you use in your products. There is no obligation, of course.

send for

your free copy of the G-S Small Gear Bulletin, by simply asking for it on company stationary. Send for a copy now, and discuss your needs with our skilled engineers.

GEAR Specialties

Spurs • Spurals • Helicals • Bevels • Internals • Worm Gearing • Racks • Thread Grinding

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MEMBER OF AGMA

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARS

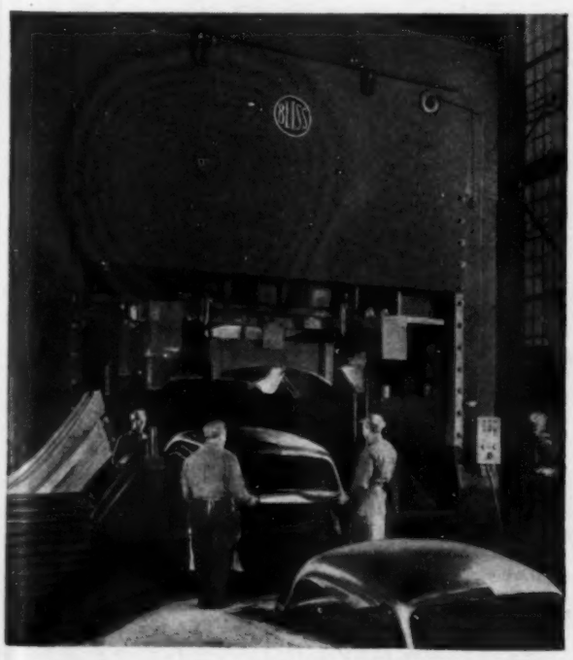
Why 75% of Large Detroit Stamper's Presses are BLISS

Counsel on right press for job and prompt service are big factors

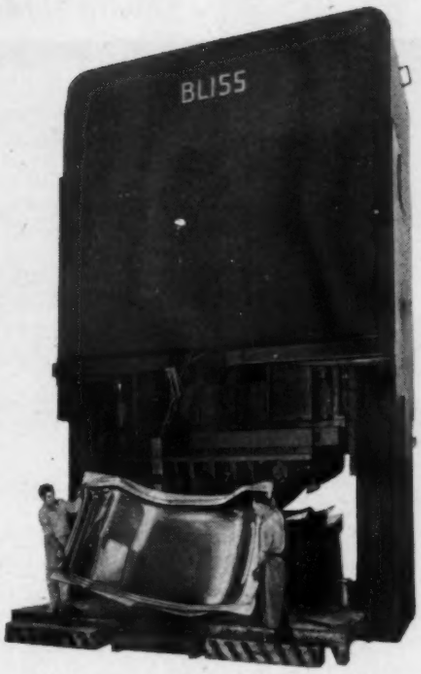
Over 100 Bliss presses of all types and sizes fabricate a diversified line of steel products in the Detroit plant of one of America's largest producers of automotive parts and home appliances. They constitute 75% of the presses on its floors and range from a 40-ton Bliss inclinable press to a 1400-ton triple-action toggle press which forms the turret tops of low, medium and high-priced cars.

Selection of the right press for the specific job is made only after careful study and recommendations by the Bliss engineering staff, according to this plant's pressroom superintendent. It is this ever-expanding fund of knowledge, over 90 years in the making, that has made Bliss the first choice of stampers the world over. "Ranking next in importance," he says, "is Bliss' prompt service when parts have to be replaced or the presses serviced."

It's another reason why the pressed metal industry knows that Bliss on a press is more than a name—it's a guarantee!...why it pays *you* to put your press problem up to Bliss.



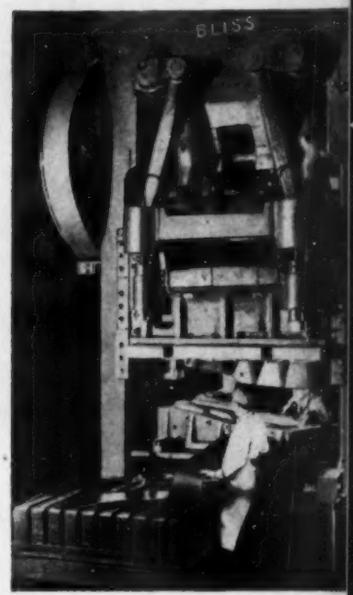
Trimming the turret top in a 650-ton, 4-point enclosed single action press with 160" wide bed. Operation is by electric push-button. Operators simply load and unload.



Turret top completely formed with one stroke of Bliss enclosed Toggle Press is shown after being removed from die.

1400-ton triple-action enclosed toggle presses form turret tops. Press has four points of pressure on blank-holder slide; is made of stress-relieved steel.

Blanking salvaged scrap steel in No. 21½ Inclinable Press. Die cushion in bed permits shallow drawing.



Deep pillars are drawn in Bliss No. 795½ Toggle Press. "The finest drawing press on the market," said the pressroom superintendent.

E. W. BLISS COMPANY, DETROIT 2, MICHIGAN

Mechanical and Hydraulic Presses, Rolling Mills, Container Machinery

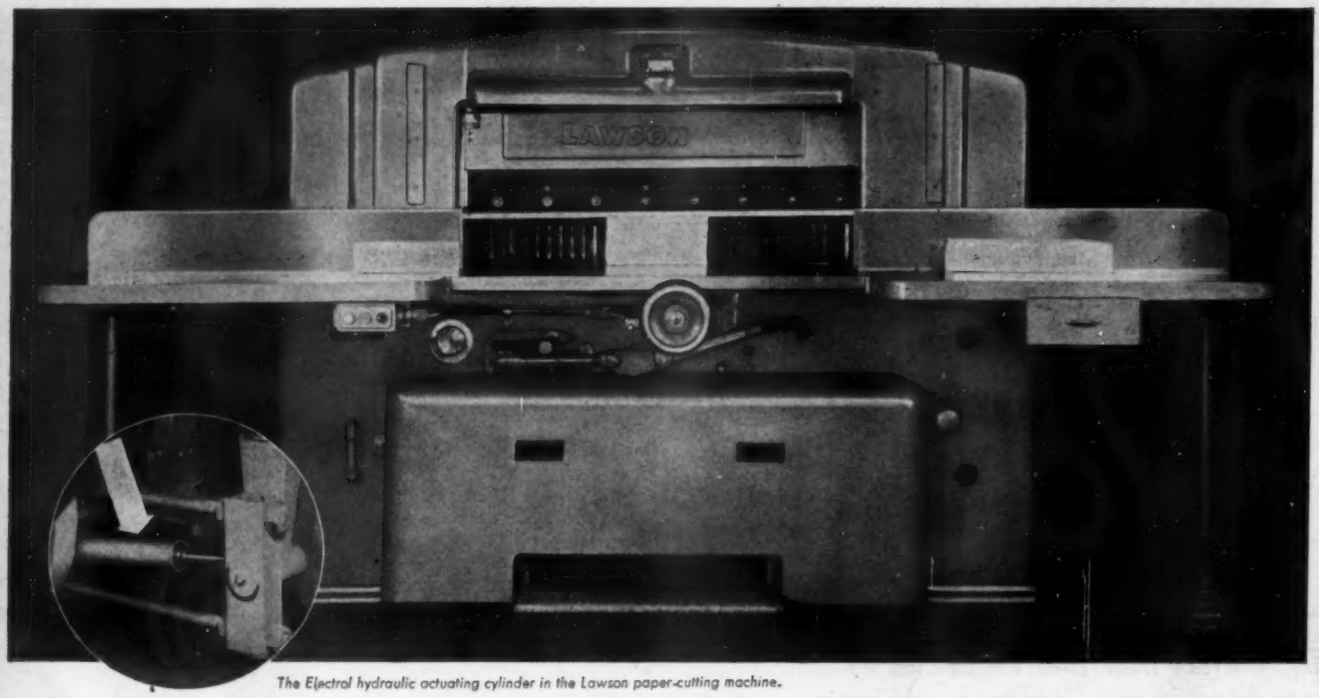
WORKS AT: Toledo, Cleveland, Salem, Ohio; Hastings, Mich.; Englewood, N. J.; Derby, England; St. Ouen sur Seine, France • SALES OFFICES AT: Detroit, Hastings, Mich.; New York, Rochester, N. Y.; Cleveland, Dayton, Toledo, Salem, Ohio; Philadelphia, Pittsburgh, Pa.; Chicago, Ill.; New Haven, Conn.; Windsor, Ont.

STAY AHEAD WITH Bliss

BLISS BUILDS MORE TYPES AND SIZES OF PRESSES THAN ANY OTHER COMPANY IN THE WORLD

TIP-TOE TREADLE ACTION CONTROLS TONS

with Hydraulic Engineering by Electrol



The Electrol hydraulic actuating cylinder in the Lawson paper-cutting machine.

How E. P. Lawson Company Built the First Successful Automatic Hydraulic Clamp Paper Cutter

Attracting wide attention is the new paper-cutting machine developed by E. P. Lawson Company's Frederick W. Seybold, world-recognized authority on paper cutter design and engineering.

One outstanding improvement in the Lawson machine is the use of an automatic hydraulic clamp and tip-toe treadle, which not only assures greater accuracy in cutting, but is far easier on the operator. It has other advantages, too, such as greater flexibility, faster operation and less maintenance.

To perfect this device Electrol engineers were called upon to design and build the hydraulic actuating cylinder, and supply the standard check valves of the system, without which these advantages would not be possible.

This is but one of many examples of how *hydraulic engineering by Electrol* is aiding designers to improve equipment in many fields of industry. It suggests, too, that the skill and experience of Electrol may prove of help to you in obtaining better machines for your own use—or for embodying hydraulic devices in the products you make.

Electrol engineers invite your inquiries . . . offer their co-operation in solving any problem involving hydraulics.

Electrol

INCORPORATED

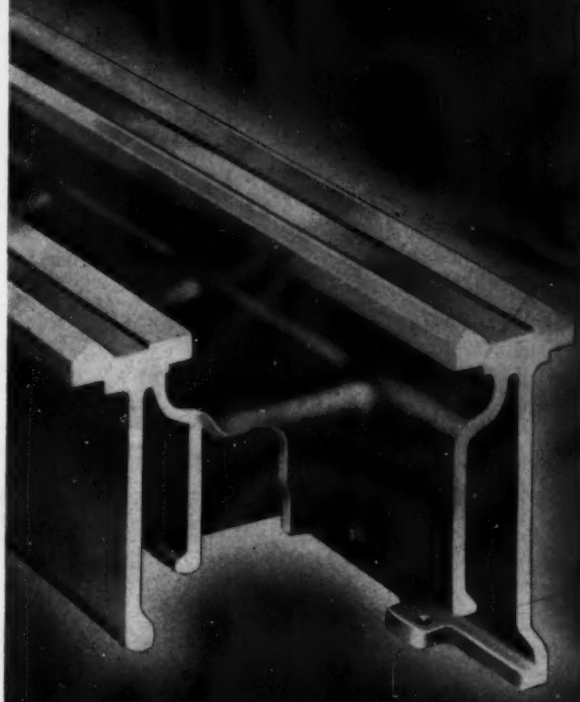
KINGSTON, NEW YORK

CYLINDERS • SELECTOR VALVES • FOLLOW-UP VALVES
CHECK VALVES • RELIEF VALVES • HAND PUMPS
POWERPAKS • LANDING GEAR OLEOS • SOLENOID
VALVES • ON-OFF VALVES • SERVO CYLINDERS • TRANSFER
VALVES • CUT-OUT VALVES • SPEED CONTROL VALVES

FOR BETTER HYDRAULIC DEVICES

The New

SIDNEY GAP LATHE



● To meet the requirements of those shops which have an occasional demand for additional swing, but the demand is not large enough to warrant an investment in a larger lathe, we offer the Sidney Gap Lathe.

This machine is furnished with the 12-speed head and provides 48 feed and thread changes.

You get the rigidity of 4 wall bed construction—the same high precision work—the same ease of operation as obtained from all Sidney 12-speed lathes.

In short, it offers all the advantages of the 12-speed lathes plus the utility of greater swing.

If your work calls for additional swing on an occasional job investigate the economy of this Sidney Gap Lathe. Full descriptive bulletin available.

SIDNEY MACHINE TOOL COMPANY · SIDNEY, OHIO

Builders of Precision Machinery Since 1904

deep slotting in magnesium

with
BARBER
COLMAN
Job-Engineered
CUTTERS

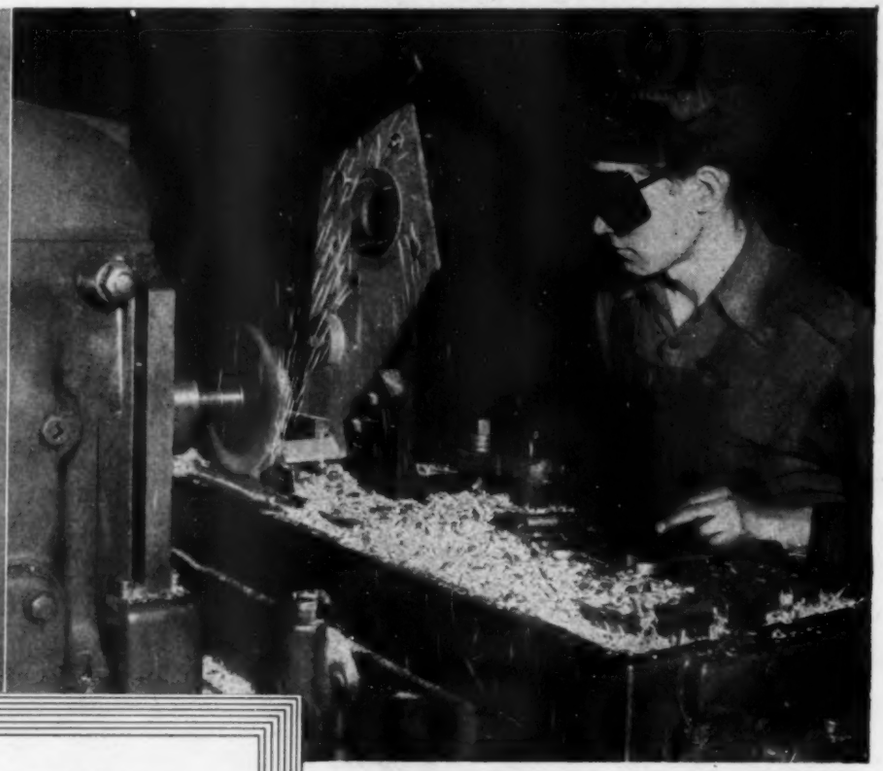
Deep slotting cuts in soft materials, when using conventional cutters, often result in chip congestion in the cutter, causing poor finish, and possible cutter breakage. Barber-Colman cutter engineers have designed a new style slotting cutter to take care of just such conditions.

On the job illustrated here . . . a typical example of this kind of milling . . . slots, 1.138″ wide x 1″ deep x 2″ long, are rapidly milled from solid metal in magnesium brackets. Cutting time averages two pieces per minute. A patented Barber-Colman improved design interlocking side milling cutter which has coarse staggered teeth arranged with continuous cutting edges, is used to provide a free flow of chips.

When production calls for high speed milling of light metals, call on Barber-Colman Engineers for long-lived, efficient cutters, specially engineered for the job.

Barber-Colman Company

GENERAL OFFICES AND PLANT 184 LOOMIS ST., ROCKFORD, ILLINOIS, U.S.A.



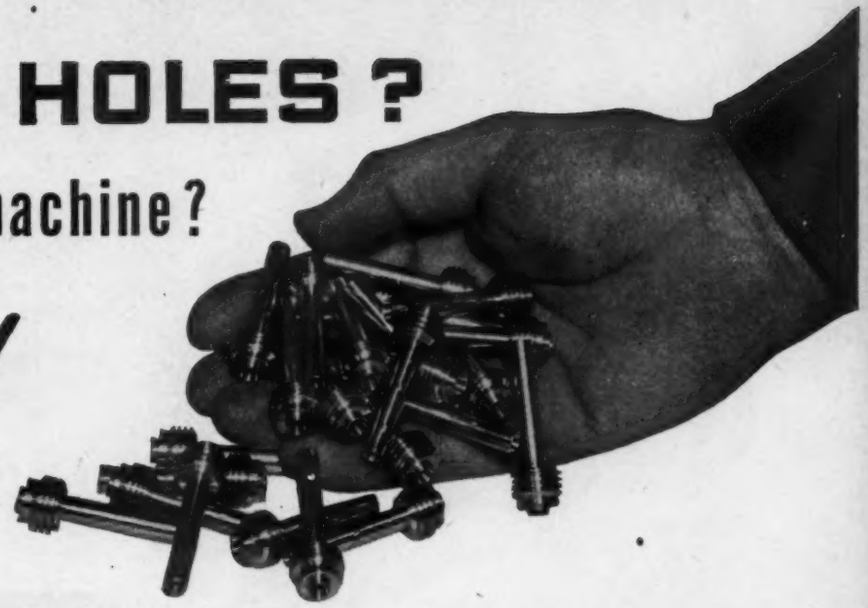
JOB FACTS

Material — Cast Magnesium, Soft
Operation — Mill slot, 1.138″ wide x 1″ deep x 2″ long
Cutter — Patented B-C Interlocking Staggered Tooth Side Mill, 6″ x 1-3/16″ x 1-1/4″
Feed — 24″ per minute
Cutter Speed — 750 S.F.M., 480 R.P.M.
Floor-to-Floor Time — 1/2 minute
Tool Life — 300 pieces per sharpening

BARBER COLMAN
MODERN MACHINES DEMAND *Modern* CUTTING TOOLS

SQUARE HOLES?

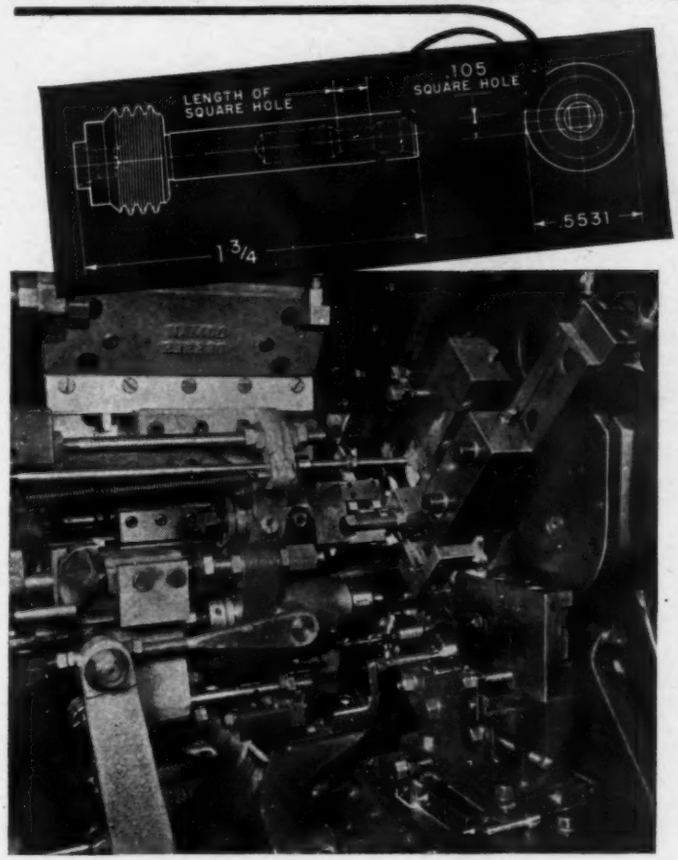
...on a screw machine?



YES!

IT'S ONE OF 15 OPERATIONS performed in a total time of

5 SECONDS FLAT!



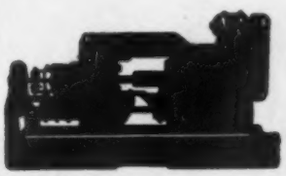
BRASS MAGNET SHAFT — made complete in one setup on an Acme-Gridley 9/16" RA 6 spindle automatic screw machine. Time, 5 seconds —for fifteen operations, including pickoff and counterbore of large end.

Production at the rate of 720 parts per hour—that's one example of the kind of competition you're up against!

And if you're trying to keep your own costs down—and production up—with prewar machines, or even with Defense Plant equipment—you're liable to lose the race.

Today's Acme-Gridleys, built for tomorrow's feeds and speeds, are your one best answer. They're *rugged*—deliver dependable accuracy as fast and as long as you need it. They're easy to operate, easy to tool up, too. You'll save production time and money on every part. Simple, positive, close-coupled camming with quick job change-over, takes care of that. Wide, open tooling zones give plenty of room for fast clearance of big-volume, high-production chips—and for time saving, power-driven auxiliaries.

Better get the full facts.



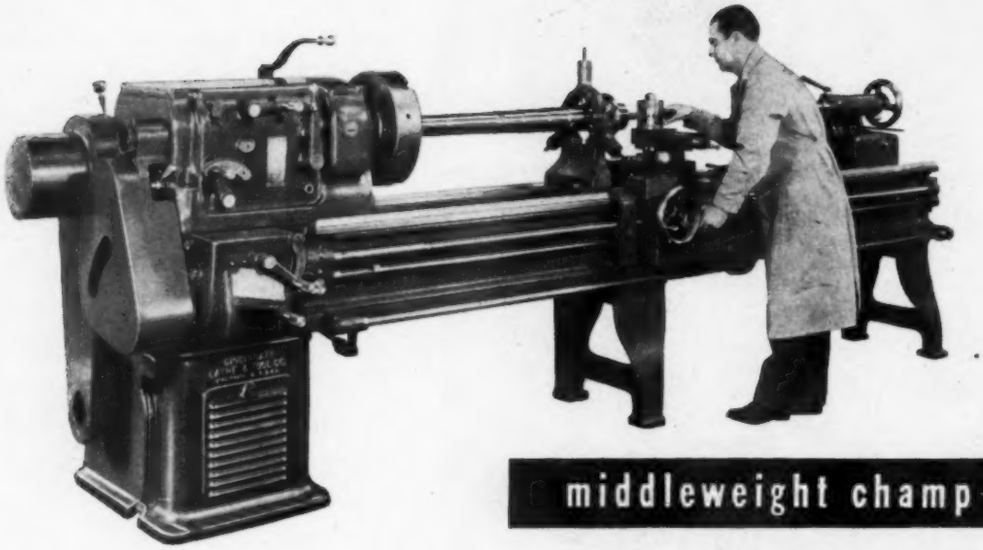
ACME-GRIDLEY BAR and CHUCKING AUTOMATICS built in 4, 6 and 8 spindle styles, maintain accuracy at the highest spindle speeds and fastest feeds modern cutting tools can withstand.

THE NATIONAL ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO

The new Traytop line of light duty geared head engine lathes (10", 12½", 15", and 18" swing sizes) offers many "high price" lathe features at truly low cost: 12 spindle speeds, selected by color-coded dial; 48 thread and feed changes; exceptionally large spindles, anti-friction bearings, double-walled apron; totally enclosed gear box; many others. Distance between centers from 18" to 60". 15" and 18" sizes can be furnished with gap and gap block. Write for Bulletin T-100.

lightweight champ



middleweight champ

In the medium duty class, the Standard line (14", 16", 18", 20", 22", and 24" nominal swings) assures you real all-around utility with exceptionally low initial investment; quickly pays for itself by efficient handling of practically all your turning, boring, and threading operations. 12 spindle speeds; 32 thread and feed changes; distance between centers from 32" to 238". All sizes available with gap and gap block. Write for Bulletin S-100.

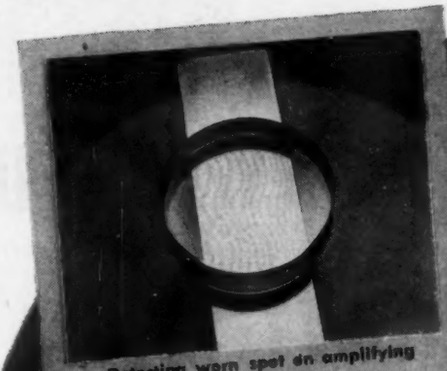
cintilathe

OF OUTSTANDING VALUE

CINCINNATI LATHE & TOOL CO., CINCINNATI 9, OHIO

Van Keuren

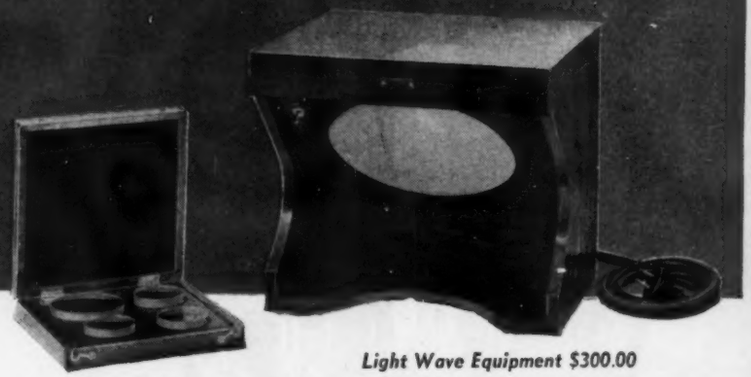
LIGHT WAVE EQUIPMENTS
are the proof of Precision



Detecting worn spot on amplifying gage anvil.

Checking flatness of lapped shoulder on a shaft with a special 3" diameter x 29/32" hole Fused Quartz Optical Flat.

Checking the flatness and parallelism of a micrometer anvil and spindle with a 1¼" diameter Van Keuren Fused Quartz Optical Parallel.



Light Wave Equipment $300.00

Twenty-eight years ago, when the Van Keuren Light Wave Equipment was introduced to American Industry, measurements in Millionths of an inch seemed visionary and unnecessary. Today's and tomorrow's production requirements are specified in Micro-inches (millionths of an inch) and the ability to measure in these units is no longer visionary but a *must*.

The Van Keuren Light Wave Equipment includes a set of 4 self-checking double surface FUSED QUARTZ optical flats and an improved, instant starting 60 cycle 110 volt, minimum heat monochromatic light (light of one wave length or color).

Fused Quartz is highly transparent. It is extremely hard and has exceptional wearing qualities. It is free from strain and will not change its shape with time. Its expansion and contraction due to temperature change is less than that of any other known material. It is an ideal material for optical flats.

Insist on having Van Keuren optical flats. They are beautifully finished and are of superlative accuracy on both sides. They are the best buy.

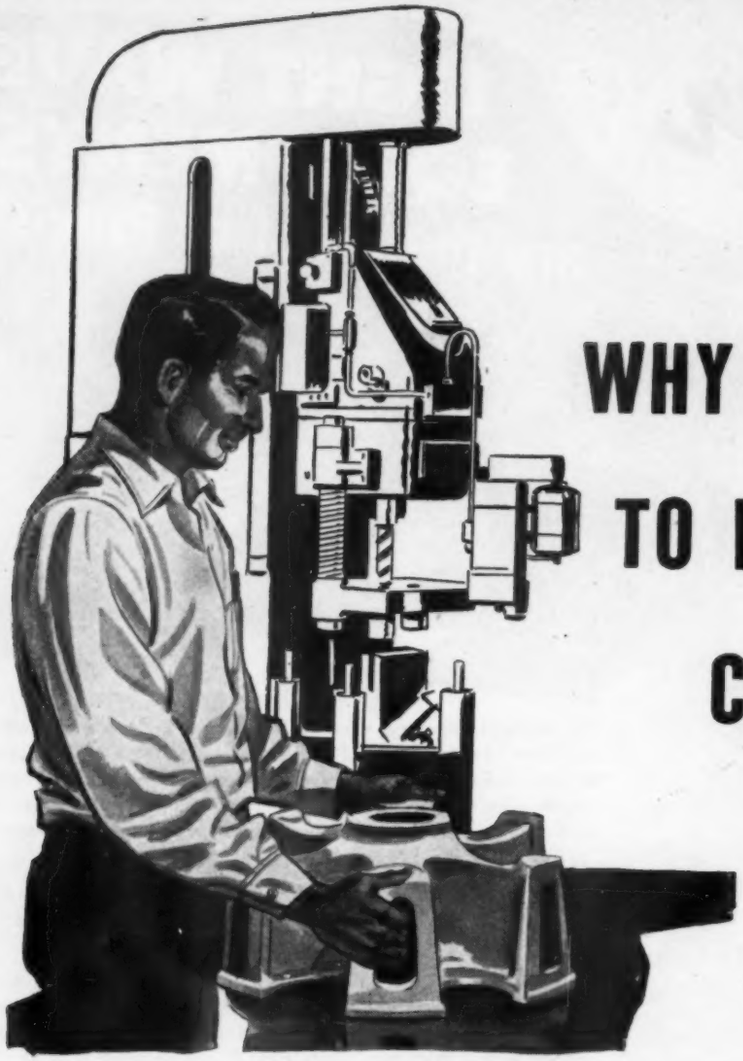
Every plant that uses amplifying gages, measuring machines or gage blocks should have a Van Keuren Light Wave Equipment for the maintenance of these expensive tools. The equipment will instantly detect worn spots and grooves in anvils and measuring contacts, which if are not known will lead to false results. The equipment will check the flatness, parallelism and make size comparisons of gage blocks in one operation, and with elimination of temperature errors. Full instructions showing practical applications are supplied with each equipment.

The new 1948 VK Catalog and Handbook No. 34, is a 208 page manual indispensable for engineers, designers, inspectors, toolmakers and machinists. It contains simplified formulas and accurate tables for measuring spur gears, helical gears, splines and worms. New and epoch making formulas and tables are presented for the first time for the exact measurement of 29°, 40° and 60° single and multiple start screw threads and worms. It includes a complete resume of American and European screw thread systems, new methods of measuring included angle of screw threads, a new method of inspecting flat ring seal surfaces with light waves, and other valuable information. Price $1.00 each postpaid.

THE Van Keuren CO., 176 WALTHAM STREET, WATERTOWN, MASS.

29th YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires



WHY BE "WEDDED" TO HEAVY METAL CASTINGS?

PRICE? Not these days! You can buy many aluminum castings at prices competitive with gray iron... a lot cheaper in the finished product than you ever thought aluminum castings could be.

STRENGTH? Alcoa 319-T6 Casting Alloy, for example, has a typical tensile strength of 36,000 psi. And because aluminum weighs 60% *less* than cast iron, you can beef up highly stressed sections and still save ½ in weight.

DELIVERY? That's another point in favor of aluminum. Alcoa has 4 sand foundries, 4 permanent-mold foundries, and 2 die-casting plants. The one nearest you can go to work *today* on your order for aluminum castings.

Ask the nearby Alcoa sales office to give you quotations on your castings requirements. You'll be amazed at the low prices, high quality, and prompt service on quotations and finished castings. ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pennsylvania. Sales offices in 54 leading cities.

An Alcoa Castings Case History

A manufacturer of air compressors discovered that he could buy cast aluminum compressor pistons for $5.50 each. The heavy metal pistons he had been using were costing him $11.50. He saved 52% by switching to Alcoa Aluminum Castings.

ALCOA CASTING PLANTS AT BRIDGEPORT, CONN. • CLEVELAND DETROIT • GARWOOD, N. J. • CHICAGO, ILL. • LOS ANGELES

Aluminum Castings by ALCOA

ALCOA ALUMINUM

SAND • DIE PERMANENT • MOLD •

PROVED AGAIN AND AGAIN
"the handiest machine in the shop"

TWENTY YEARS AGO WE SAID

"Ten Men with 20 hands . . .

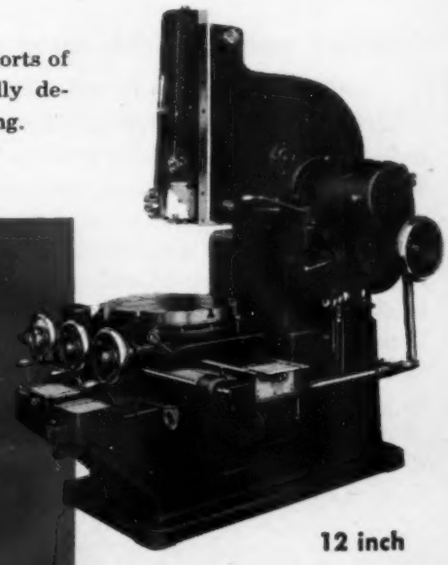
couldn't keep pace with either the output or the accuracy of this P&W Vertical Shaper." Twenty years ago the P&W Vertical Shaper was a shop sensation because it could machine much work usually done by hand. Today the Vertical Shaper is as accepted in toolrooms as a lathe . . . "couldn't imagine being without it". In principle it's still the same machine we introduced years ago, plus all the advancement in machine tool building that 20 years have produced. It machines those hard-to-reach surfaces, odd bosses and slots, relief angles . . . usually without setup changes or special tooling. Work is easy to mount . . . easy to index . . . to feed . . . to observe and control. Machinists like to use the Vertical Shaper to save their time — and your money. That's why everyone calls it "the handiest machine in the shop". Pratt & Whitney, *Division* Niles-Bement-Pond Company, West Hartford 1, Connecticut.

Ideal for machining jigs, fixtures, blanking dies and all sorts of irregular shapes, P&W's two Vertical Shapers are fully described in a 16-page booklet which is yours for the asking.

PRATT & WHITNEY

Vertical Shaper

6 inch 12 inch



12 inch

Right: Regulates speed of cooky machine to meet each change in operating conditions.

Below: Assures precision timing to meet changes in can size, product, etc., on closing machine.

Above: Provides infinite speed adjustability for spindle on tool room milling machine.

Above: Controls speed of pumps supplying chemical ingredients to blending and refining machine.

Combines motor, variable speed mechanism and gear reducer in single, compact unit

Widely applied to driven machines in all types of industries, especially where space is limited or where direct connection is desired, REEVES Motodrive provides machines with infinite, accurate speed adjustability to meet the requirements of every operating condition. The compact, self-enclosed unit is available in six sizes, covering capacities from ¼ to 15 hp and in speed ratios from 2:1 through 6:1. Helical reduction gears in ratios up to 189:1 may be incorporated to provide output speeds as high as 3,480 rpm. The Motodrive is built in both horizontal and vertical designs and may be equipped with either handwheel, push-button or completely automatic control.

Besides the Motodrive, REEVES offers two other basic units—the Variable Speed Transmission and the Vari-Speed Motor Pulley—in the widest selection of designs, sizes, capacities, speed ratios and controls, to round out the complete line of REEVES Speed Control.

REEVES Variable Speed Drives improve quality, increase production, and reduce operating cost by providing exactly the right speed for each machine (operating independently or in a series), each operation, each operator, and each material under every changing condition.

Proved in more than 265,000 diversified industrial installations, REEVES Speed Control is easily installed on machines already in service and is now standard equipment on over 2,100 different makes of modern machines.

An experienced REEVES Speed Control Engineer will be glad to consult with you on your particular speed control problem. Write for comprehensive, 114-page catalog—A-450A.

REEVES PULLEY COMPANY • COLUMBUS, INDIANA

Recognized Leader in the Specialized Field of Speed Control Engineering

ACCURATE • VARIABLE

Reeves Speed Control

GIVES THE RIGHT SPEED FOR EVERY JOB!

SPOT NEWS OF METALWORKING

One motor car maker thinks the low-priced car will be a reality in a few years. His car will have a die-cast engine (on which his engineers are working) and die-cast body parts, such as doors, panels and dash assembly.

By purchasing slightly larger steel sheets, one metalworking company is able to get much more salvage value from the scrap. The waste is large enough to be used for smaller sheet metal parts. One important manufacturer, by following this practice, secures from one to five more pieces from one steel sheet.

War talk has frozen a lot of estimates on big tooling jobs in various metalworking centers until the defense program is clarified. The pending jobs are on peacetime products. Prospective customers don't want to give the green light until they know whether they are going to have to scrap their plans and go to work on munitions orders.

An automobile company which purchased a blast furnace is in a unique trading position. It can get all the castings it needs, to begin with, but also finds that some of the steel makers are eager to trade sheet steel for pig iron.

Induction heating, using frequencies from 60 to 200,000 cycles, seems likely to be widely used in various industrial processes the next few years, states F. R. Benedict, manager industry engineering, Westinghouse Electric Corp. Potential market for infra-red heating indicates absorption capacity of 200,000 kw. of this type of heating during next 10 years.

> **Plants operating under security clause contracts have little to fear Munitions Board will act immediately to take them under control—there are no funds for such a move and no program set up for this action. Order to WAA to halt sales until Board determines whether plants need security clause has not stopped negotiations but prevents consummation of sale until approval is received.**

Coal mine conveyor troughs 12 ft. long are being completely welded in 2 min. by automatic stitch welding machine made by Fusarc Ltd., Gateshead-on-Tyne, England. This company also is welding bosses on to sheet metal. The electrode is fed automatically into the mold on a time cycle and a predetermined amount of weld metal is deposited. Welding time on bosses 1¼ in. in diameter and ⅜ in. thick is 30 sec.

Resistance welding has become so popular—including spot, seam, projection and butt welding—that deliveries of resistance welding equipment to industry in 1947 was over five times the shipments in 1938-1939, according to Resistance Welder Manufacturers' Association.

Venn-Severin Engine Co., Chicago, has been purchased by Mahindra & Mahindra, Ltd., Bombay, for removal to India. Plant will stay in Chicago, however, for 12-18 months to train Indian firm's technicians, meanwhile shipping 250 complete diesel engines and assemblies for 750 more. Mahindra & Mahindra is negotiating for removal of a U.S. air-conditioning equipment factory.

False convertible models made entirely of steel, both with and without fabric cemented to steel non-collapsible tops, will be offered late this year by a Detroit car manufacturer. These cars will have safety and strength of all-steel body and smart appearance of convertible.

Canada's dollar squeeze, with drastic import restrictions, has forced Ford of Canada to make fuel pumps and other accessories there which formerly were shipped in from Dearborn. Other U.S. car makers with Canadian operations are in the same fix.

More labor control legislation may result from the coal strike. Congress is considering three proposals: further regulation of employer-contributed union welfare funds, restoration of wartime seizure powers and a law against "monopolistic strikes."

Gaging Metalworking

Metalworking Index Off

The Index of Metal Working Production dropped one point in March to 226, with two of the components lower, two unchanged and one increasing one point.

The sharpest break came in Autos and Trucks. The drop was four points to 234. Electrical Machinery eased down from 239 to 238. Machinery rose one point to 251 and Transportation Equipment and Other Metalworking held at 289 and 156 respectively. The slump in Autos and Trucks was the result of the usual seasonal retooling programs for next year's models and it was for this reason mainly that the Index dipped.

Metalworking Stimulated

The war crisis is having the effect of stimulating demand for metal goods and in turn of bolstering metalworking production. In the last ten days the softness in some consumer lines has shown signs of disappearing. Up until then Detroit, for example, had felt that a buyer's market by late summer was inevitable except perhaps in the Chevrolet-Ford-Plymouth lines. Now observers are not so sure. New buying has begun by car users who figure that they had better get a new model before automotive assemblies are affected by a defense program. The same sort of psychology is at work in commodities rather than automobiles.

▸ Metalworking manufacturers, like their customers, are eager to get what they can while they can get it. Instead of attempting consciously to cut down inventories sharply, they are inclined to acquire stocks of raw material wherever they can. Steel is in tighter supply than ever as a result of this change. The same situation exists in copper, lead, aluminum and zinc. The only brake upon this liberalization of policy is the fear in some quarters that metalworking companies will be stuck with large proportions of inventory items suitable only for peacetime products.

Aircraft Industry Waiting

Despite the report of aircraft programs and of a flurry of excitement through the aircraft industry, not much actually has happened yet. No appropriations have been authorized by Congress covering the proposed expansion. West Coast plane makers, to be specific, have not started any retooling or placing of parts contracts except in a few instances. But they are working their engineering departments pretty hard.

In the East plans are afoot for aircraft engine and frame plants to increase their output. Some war plants are to be reactivated. But the full scope of the program is not known and probably has not been determined. Along with the plane program will go an Ordnance program to previde weapons for the military craft.

The active launching of the European Recovery Program is expected to provide additional business for metalworking companies.

Coal Strike Deterrent

Offsetting the factors supporting high metalworking production is the coal strike. Inadequate coal stocks and particularly curtailment of steel production because of the dwindling coal supply are of deep concern to many companies. The effect of the strike began to be felt by steel mills about April 5 and already have cut into deliveries. Many important manufacturers in the Chicago area, for example, report that operations scheduled to drop 50% or lower and in some cases already are there.

Although the strike suddenly ended, its effects will act as deterrent upon metalworking operations for some weeks and much of the lost production never will be made up.

Lead Price Jumps

First reaction to the "defense boom" in the way of stiffening prices, which in many fields had showed signs of softness, was the 2½-cent increase in the price of lead. Mounting used-car prices was another indication. All this may be summed up to mean that prices will remain at their present highs or increase and that the old-time competition in many lines will be postponed again.

Metalworking Sales, Profits Up

With profits at record highs, and controversy concerning them in record volume, the reports now coming in on 1947 earnings show a striking picture. In metalworking, the profit picture can be roughly summarized:

Profits are at record highs, but sales volume is also setting records.

Except for shipbuilding and railway equipment companies, and aircraft builders (who ran up a deficit) metalworking industries show gains of at least 52% over 1946. But 1946 earnings were held down by strikes and material shortages.

Measured as a percentage of companies' net worth, profits for metalworking industries, except aircraft, range from 10 to 34%. But this too overstates earnings because net worth is figured on "book value," which is based on original cost of plant and equipment. Inflation puts book value well below today's actual value. This is particularly true in most metalworking industries where capital investment per worker is relatively high.

Measured as a percentage of sales, metalworking profits are relatively modest, ranging from 5.9 to 11% in major classifications of the industries.

Most profits are going to finance new plants and equipment. Industry last year, according to Department of Commerce figures, invested some $14.7 billion. Retained earnings of $10 billion financed a major part of this. Unless much more new money is available from investment markets than has been, retained earnings must continue to finance a large part of industry's expansion needs.

American Machinist INDEX of Metalworking Production

		COMPONENTS				
		MACHINERY	ELECTRICAL MACHINERY	AUTOS, TRUCKS	TRANSPORTATION EQUIPMENT	OTHER METALWORKING
MARCH 1948	226	251	238	234	289	156
FEBRUARY 1948	227	250	239	238	289	156
MARCH 1947	222	239	244	224	305	153

Buyers Holding Off

Though machine tool sales have been fairly good, the fact is increasingly evident that important buyers are holding off until they know what form the proposed defense program is likely to assume. Programs involving the tooling up of new or redesigned peacetime products, including automobiles, are not likely to be released until manufacturers have definite assurance that they will be able to produce these items over a prolonged period. Otherwise they will not be able to justify the cost involved. The result is that an enormous number of inquiries for machine tools are pending.

▶ The projected defense program has not even created a ripple so far as new machine tool business is concerned. It is believed that any new tooling needed in the months immediately ahead will be largely for special machines rather than general-purpose equipment.

Builders Look to ERP

Machine tool builders are looking hopefully to ERP for orders. A backlog of demand totaling $122 million has been built up by European nations which do not have the dollars to buy the needed equipment. The machine tool industry has suffered recently because its foreign business, usually comprising 20% to 25% of its volume, has dwindled to small proportions because of dollar shortages.

Because foreign governments will use their dollar resources sparingly, their emphasis in buying in the U.S. will be on equipment to build up their production. The countries outside the Marshall Plan can be expected to pick up capital equipment available and not allocated to ERP.

ERP will maintain or even increase the volume of exports to Western Europe. It will also give the Latin American countries enough dollars so that they can keep on buying here at the rate they did in 1947. "Off-shore" buying under ERP will give them some $1.7 billion in the first year of the program.

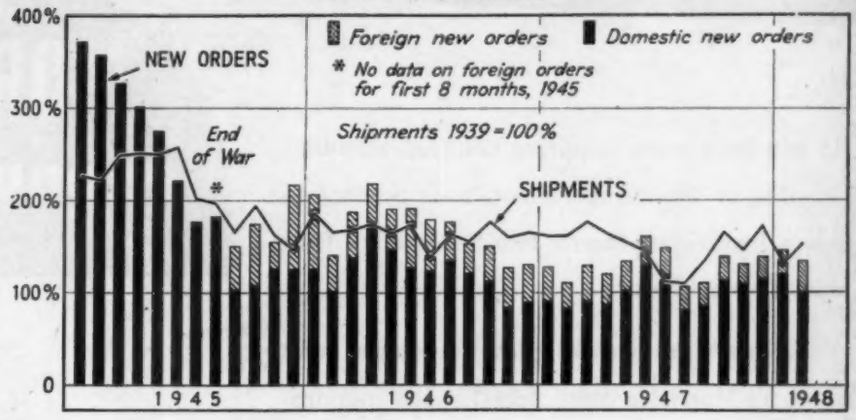
Exports to Canada, Asia and other parts of the world, however, may run below the 1947 levels until their earnings of dollars begin to pick up again.

Plant Expansion Continues

Despite unsettled conditions in the manufacturing field due to the war talk, plant expansion continues throughout the country at a high level. An excellent example of this trend in industrial development is in the Chicago area where the first three months of 1948 show an increase of more than $7 million above the corresponding period in 1948.

Index Of Machine Tool Orders and Shipments

(Reported Monthly to NMTBA)



Stockpiling to Hit Industry

Military stockpiling is expected to affect industry more than any other part of the munitions program. With the war crisis the Munitions Board, which had been slowed up considerably by strong opposition from the Commerce Department, will have more than three times the amount of money for buying up vital materials in 1949 than during this year. Manufacturers will be forced to look to new domestic and foreign sources for materials.

Aluminum Situation Dark

Would-be users of aluminum have found it next to impossible to obtain any form of the metal since the first of the year, and their clamoring of a shortage is loud. But, the real story behind the shortage is that production this year will be around 100 million pounds less than last year and that steady users are already being rationed.

This shortage is exclusive of any increased plane building. If the military decides on a tremendous program, even present users of the light metal will be cut more than half.

Two things are resulting in the drop in output: Lack of capacity and lack of electric power. Ore is plentiful and the shortage of capacity does not enter into this picture as it only effects prospective users.

Lack of water power, due to drought, has clipped power down considerably. This has caused curtailment of producing facilities. To top off this picture of limited supply is that last year the military sold considerable of stockpiled aluminum which aided fabricators by quite a large percentage.

Fabrication Reduced

Aluminum producers have already cut back their fabrication divisions so that other fabricators—good customers in the past—may continue to draw wire, forge, roll and cast products. Now even the outside fabricators are feeling the pinch.

On the capacity side, the peak production during the war (1943) 1,840,000,000 pounds of the metal were produced. It is generally estimated that the metalworking industry would use this amount of metal if it were available, especially with the prevaling lack of steel.

The capacity of the three major producers is fairly accurately set at 1,285,230,000 pounds yearly. This is 555 million pounds less than the wartime peak. Last year, with practically the same capacity only 1,143,500,000 pounds were produced, augmented by stockpile releases.

100 Million Less Expected

This year 100 million pounds less is anticipated, with the possibility of even less, and the government will not release any aluminum from its stores.

During the wartime production peak, the plane industry took 90% of all the aluminum, far above present production poundage. If power were available the only immediate possibility of increasing the yearly output is through a government-owned plant in upper New York State which has not been operated since the war. This plant is capable of producing 85 million pounds yearly.

A shortage of scrap aluminum is also slashing into the material available.

Keep Production Rolling and Costs Low . . . .

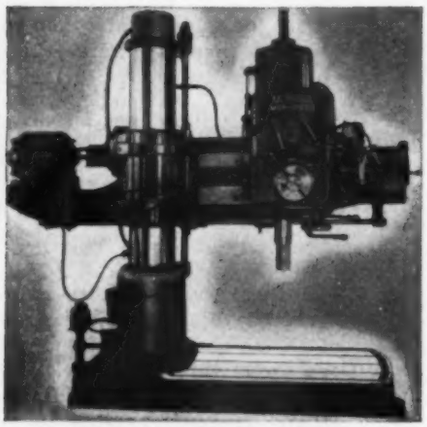
MORRIS MOR-SPEED
PRODUCTION MACHINES

If you have work requiring drilling, reaming, tapping or similar operations, on a production basis, investigate Morris Mor-Speed High Production Machines.

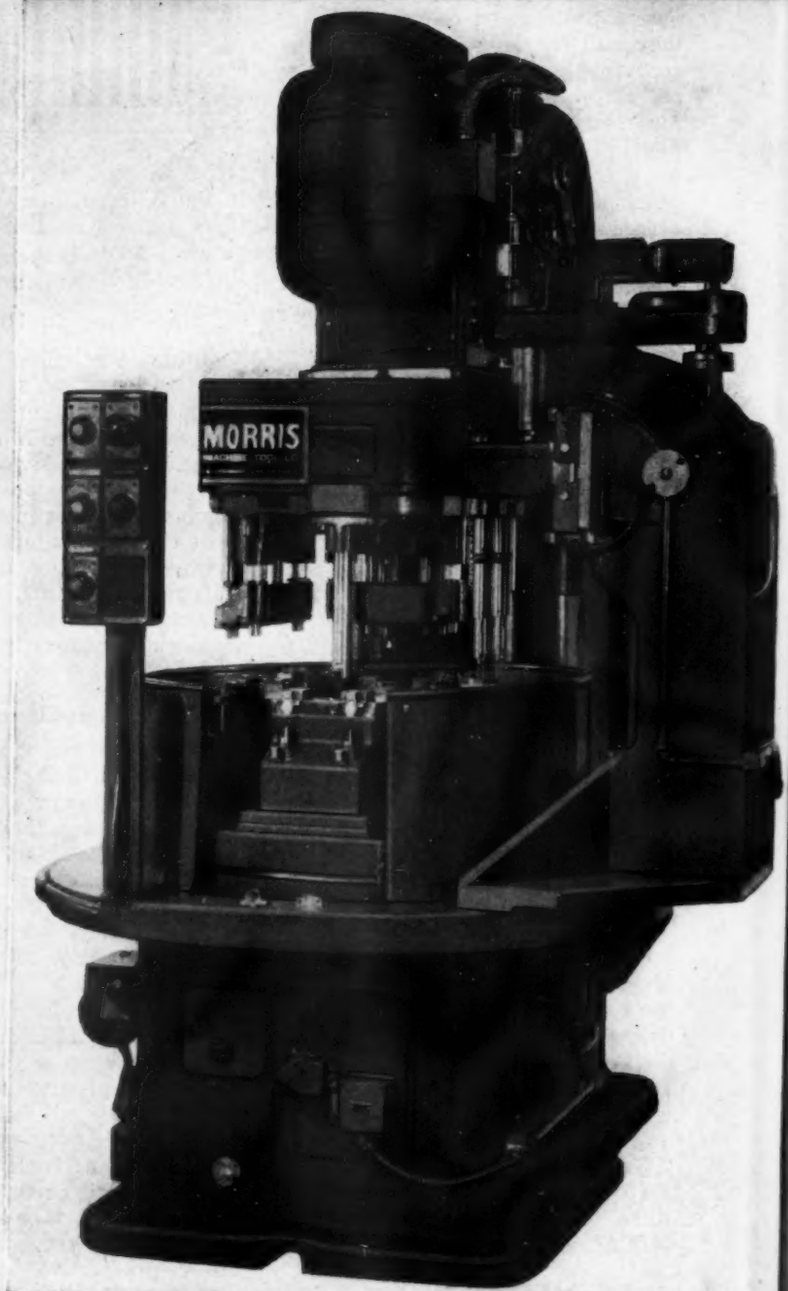
These machines are designed, developed and built by Morris to meet specific job requirements.

A typical example is the Vertical Four Station Automatic Indexing Machine illustrated. It is arranged to drill, ream and tap two 5/16-24 holes in universal joint races and is equipped with four, two position, automatic clamping fixtures.

Morris has the experience, engineering "know-how" and the facilities to design and build high production equipment to meet your needs. Consult them on your production work.



MORRIS MOR-SPEED RADIAL



Builders of MOR-SPEED Line

The MORRIS Machine Tool Co.

CINCINNATI 3, OHIO

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ☆ ESTABLISHED 1877

Production Is the Answer

A tremendous outpouring of goods looms bigger than ever as America's most pressing problem.

The European Recovery Program is now law. We have pledged ourselves to give aid to a group of countries on a scale heretofore unknown in peacetime.

That means production of all kinds of goods during the next year which will help Western Europe to become self-sustaining again.

Unless all signs fail, a defense program may be authorized before this editorial appears in print. We intend to revitalize and enlarge our air forces and to provide the essential armament for them.

We will produce various kinds of fighting equipment for our friends round the world. And And that signifies an expansion in munitions manufactures.

Our production of atomic bombs is being increased rather than curtailed.

On top of ERP and the projected military program is being piled an unsatisfied demand for civilian goods of many kinds. The sag in certain civilian items so evident a few weeks ago has already firmed up.

With employment at a peak, wages at an all-time high, and a tax bonanza dumped in consumers' laps by Congress, the retail market should be hot indefinitely.

All of these factors add up to a situation spelling further inflation. The only way to keep that inflation under reasonable control is to produce enough military and civilian goods to satisfy the demand.

To solve the problem satisfactorily will take all of industry's ingenuity. Old, low-production, inefficient machines will have to be junked in favor of new, high-production, efficient machines.

It will be necessary as never before to get the greatest output per manhour. There will be two incentives to do this—the need for higher productivity and the urge to keep costs down.

Wasteful practices must go. There won't be enough materials to permit the luxury of wastefulness. If materials become shorter, as they are likely to be, manufacturers will have to resort again to the resourcefulness in changed designs and manufacturing methods which served them so well in the 1939-1945 period.

The days immediately ahead call for high ability, courage, boldness and vision on the part of Metalworking management.

Burnham Finney

EDITOR

Contouring IRREGULAR Shapes

1. by **AUTOMATIC DUPLICATION**

2. by **MANUAL CONTROL**

Cincinnati Shapers contour irregular shap
—economically—whether in the tool roo
or in the manufacturing plant.

(1) Where production is desired, costs a
reduced by accurate automatic duplicatio

(2) A unit or small lot is economically pr
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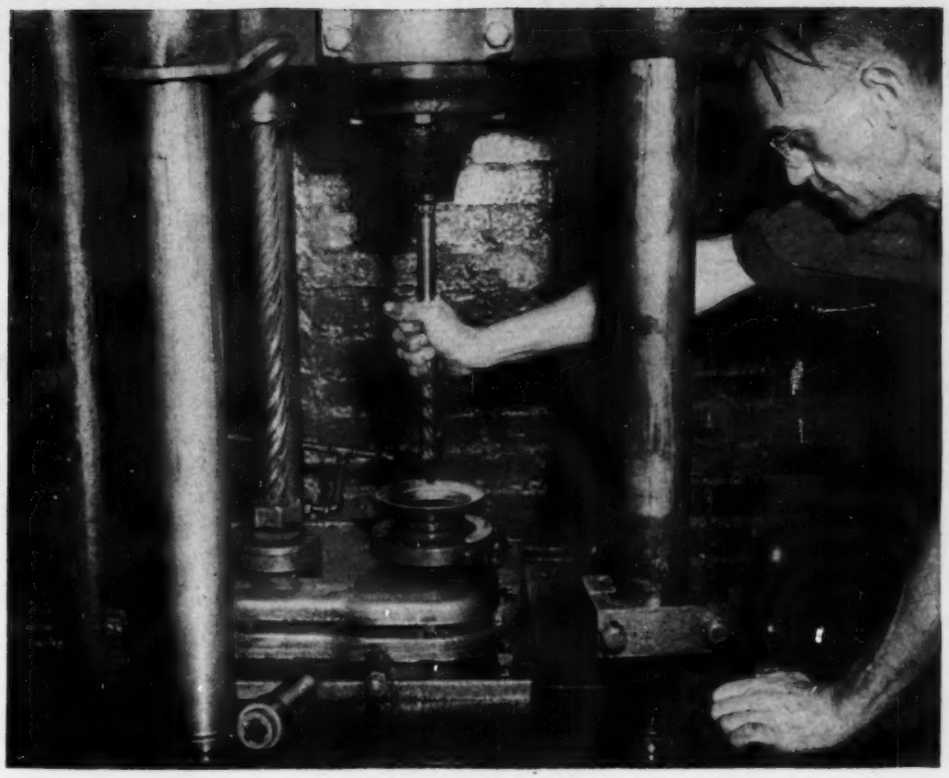


FIG. 1.. Internal threading of power feed nuts for drifter rock drills presented intricate design problem on combination broach-taps and construction of fixture to rotate work as tap is pushed through it in a broaching machine

Broach-Tap Cuts Quintuple Threads

High-helix quintuple thread requires tricky design of combination broach-taps that are pushed through work in hydraulic broaching machines

BY HARRY S. WHAREN,
ASSOCIATE EDITOR

WHEN TOOL DESIGNERS face tough problems, they do their best work. But when they meet impossible ones, they somehow do even better.

No matter how difficult the design engineers may make a job, tool engineering almost invariably comes through with a practical way of doing it. Design and tooling should both, of course, give and take a little to work out the best production design.

But when a certain design is a necessity, then tool engineering must do its best to tool the job for economical production. This situation was faced at Gardner-Denver on manufacture of NE8620 power-feed nuts for drifter rock drills.

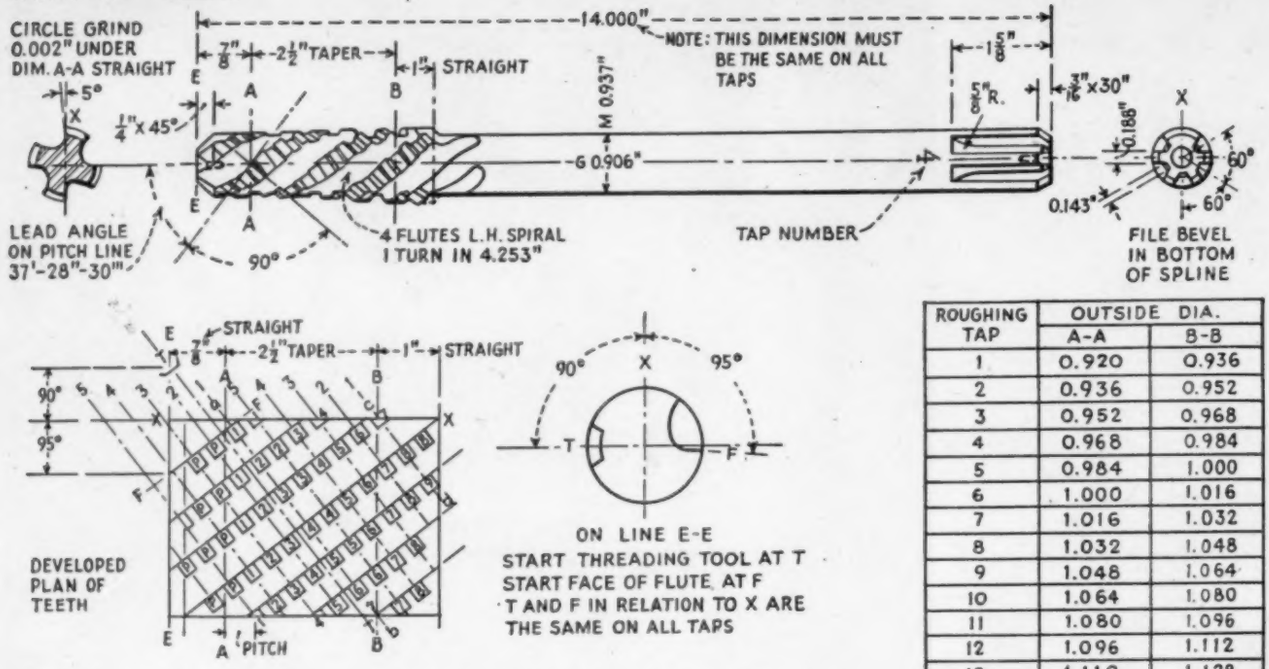
The nut, 5⅜ in. long, was to be threaded internally with a 1⅛-2 Acme right-hand quintuple thread of 1.038-in. pitch dia., 0.906 root dia., 0.500-in. pitch and 2½-in. lead. Both tap and broach manufacturers turned down the job of designing and making the cutting tools, because the helix angle was so great that torque practically equalled the thrust.

It was believed that the cutting action would be a combination of tapping and broaching, so J. B. Highland and J. T. Weiberg, tool engineers at Gardner-Denver, proceeded on that basis.

Because of length of cut (5⅜-in. straight and 8¾-in. developed helical length) and the small size of the hole, the first consideration was the flute. Its two primary requirements were that it be made large enough to take care of all chips and yet leave enough cross-sectional strength in the tap. Five flutes were found to give insufficient chip space, so four were selected.

In developing the cross-section of the tap, several forms were laid out. A straight-flute tap was considered first. This design, while it met requirements on chip space and tap strength, was believed unsatisfactory because of the cutting-face angle on the teeth.

The leading side of each tooth with this design would have an acute angle equal to the helix angle, and the other side a negative angle equal to the helix angle



ROUGHING TAP	OUTSIDE DIA. A-A	OUTSIDE DIA. B-B
1	0.920	0.936
2	0.936	0.952
3	0.952	0.968
4	0.968	0.984
5	0.984	1.000
6	1.000	1.016
7	1.016	1.032
8	1.032	1.048
9	1.048	1.064
10	1.064	1.080
11	1.080	1.096
12	1.096	1.112
13	1.112	1.128
14	1.128	1.144
15	1.144	1.160

FIG. 2 . . Tap design was started by developing the plan of the teeth, continued by determining number of taps needed according to chip load and tap strength and completed by layout of tap itself. Thread helix is right hand while flute helix is made left hand to provide good cutting

plus 90°. Such a tap would have exceptionally poor cutting action. It would dull quickly on the positive side because of the too sharp angle, and drag and gall on the negative side.

The natural solution was to make the flute helical and at right angles to the thread helix. This would make the cutting edge of each tooth (Fig. 1) square with the sides of the thread.

A flat plan of the teeth was then developed. Line *X-X*, Fig. 2, represents the axis of the tap. Line *E-E* represents the end of the tap and is equal in length to the pitch circumference of the tap. From *E-E* to *A-A* is a short straight pilot, while *A-A* to *B-B* is the tapered cutting portion and the part beyond *B-B* is again left straight for sizing.

Along the base line from *A-A* to *B-B*, threads were spaced equal to the pitch of 0.500 in. Along the line *A-A*, four lines were drawn to represent the flutes, or cutting edges, *F-F* of the teeth. These four lines were equally spaced, with the top line being dropped enough along *A-A* to have a full cutting face on the first tooth nearest to reference line *X-X*. This made the flute start at 95° instead of 90° with *X-X* as did thread reference line *T-T*.

Lines representing the threads were then drawn parallel to *T-T* through points laid out on the base line. Progression of cutting teeth in the thread would be represented by lines *a-b* and *c-d*.

With tap design established, the next step was to determine how many roughing and finishing taps would be needed to cut threads to specified depths. Bore size of

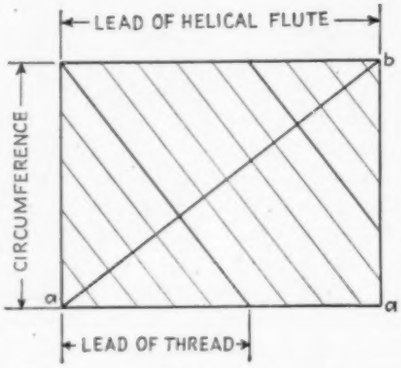


FIG. 3 . . Backing-off change gears were calculated by using ratio of number of teeth in helical path to number in straight flute. Dimension **aa** shows 1.7 for a straight flute and ab 2.7 for helical flute

feed nuts was 59/64 in., and major diameter of thread 1 9/64 in. + 0.020, giving total thread depth, over diameter, of 1.160 — 0.920 = 0.240 in.

An estimate of 15 roughing taps was made with a stock removal of 0.016 in. for each tap. These taps, 0.030 in. narrow and then to be to get a smooth thread, were followed by three finishing taps that would cut to full thread width but not remove any stock on the planned to rough out the thread depth.

The 0.016-in. stock removal had to be checked so force of cut would not exceed the tap cross-sectional strength. The layout had 6 cutting teeth per thread (portion between *A-A* and *B-B*). A cut of 0.016 in. on the diameter, or tooth depth of 0.008 in. would result in 0.008÷6 =0.0013-in. cut per tooth. This cut was considered satisfactory, because it would make the chip flexible enough to roll in the flute and occupy minimum flute space.

One last point remained of the design—how to drive and locate each tap so it would register properly with the work and track the preceding one. The shank, with its diameter made slightly smaller than the bore of the work

so the tap would drop through after finishing the cut, was splined on the driving end. Five splines were laid out on a six-spline diameter, leaving one spline oversize so the tap would always have the same radial location when placed in the driver on the broaching machine.

MACHINING TAPS

Tap threads were cut in a thread mill, backed off and finish ground in a toolroom lathe on which was mounted a toolpost grinder. Flutes were milled in a conventional mill with dividing head.

The same drive made to drive taps in the broaching machine was employed to hold taps when milling threads and flutes, backing off and finish grinding. This made all taps uniform.

To get proper thread lead on the lathe, it was necessary to use a subhead. The gearing was set for 2½ threads per in., giving a pitch of 0.400 in. As the subhead had a 6 to 1 reduction, the lead then would be $6 \times 0.400 = 2.400$ in.

But the required lead was 2.500 in., so compensating change gears were needed with a 25/24 ratio. With a machine constant (spindle straight flute along axis *aa* would have 1.7 teeth to back off. But a helical flute, represented by line *ab*, would have 2.7 teeth—a ratio of 2.7/1.7, or 1.5882.

With four flutes, a subhead ratio of 6 to 1 and a backing-off attachment ratio also of 6 to 1, change-gear ratio would be:

$$\frac{\text{number of flutes} \times \text{gear ratio}}{\text{subhead ratio} \times \text{backing-off attachment ratio}}$$

or

$$\frac{4 \times 1.5882}{6 \times 6} = 0.17646$$

Change gears selected were

$$\frac{23}{55} \times \frac{27}{64} = 0.17642.$$

Flute helix was checked to determine effect of the difference between calculated ratio of 0.17646 and actual ratio of 0.17642 on the desired normal lead of 4.250 in.

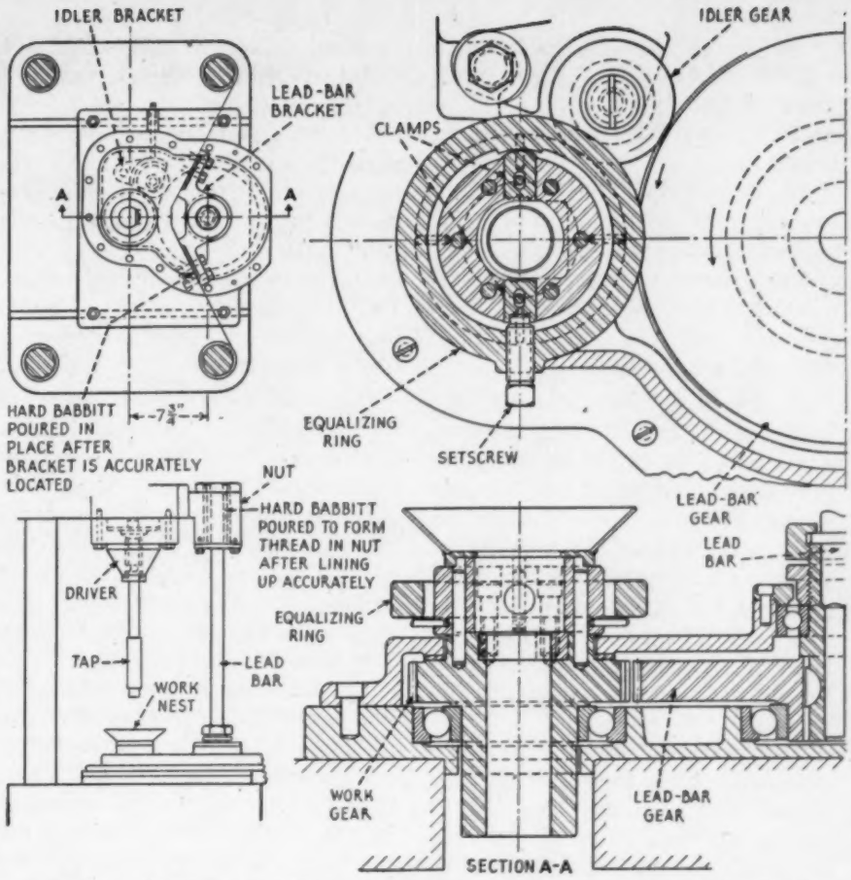


FIG. 4 . . Work of holding and turning fixture has two requirements: means of centering and clamping work and an arrangement to turn the work at the proper speed to receive the tap. First is met by two-jaw clamp in an equalizing ring, and second by master lead bar actuated by machine ram and connected to work through gearing

Corrected lead was calculated to be 4.2510025 in., thus:

$$\frac{4 \times \text{gear ratio}}{6 \times 6} = 0.1762, \text{ or}$$

$$\text{gear ratio} = 1.58778$$

$$\frac{2.7}{\text{No. of teeth}} = 1.58778, \text{ or}$$

$$\text{number of teeth} = 1.70041$$

$$\text{corrected lead} = \frac{4.250}{1.7} \times 1.70041 = 4.2510025$$

The closest helix that could be milled was 4.253, so the difference could be disregarded; even so, the error was not great enough to cause any trouble.

Taps were machined of oil-hardening tool steel in the following steps:

1. Shank was centered and turned to 0.937 in. and chamfered. Tap was reversed, turned straight to *B-B* dimension with 0.15 in. allowed for grinding and faced to 14.000-in. over-all length.

2. Spline was milled to fit driver with bevel filed on bottom of spline.

3. Thread was rough and finish milled 0.15 in. oversize for grinding with mill started at *T* in relation to *X-X* and in the special driver.

4. Pilot was turned to 0.002 in. under dimension *A-A* by ⅞-in. long and chamfered.

5. Taper (*A-A* to *B-B*) was turned 0.015 in. oversize.

6. Flutes were milled, starting at *F* in relation to *X-X* in the special driver.

7. Threads were backed off, starting at *A-A* as pilot teeth are not backed off, with 0.015 in. allowed for grinding.

8. Taps were hardened and test-

ed for straightness after hardening.

9. Shank, pilot and teeth rake were ground.

10. Thread O.D. was ground to finish size.

11. Thread sides and root diameter were circle ground to finish size, starting again at *T*.

12. Threads were back-off ground to narrow land.

Broach-Tap Fixtures

As the flute helix was at right angles to the thread helix, the lead angle being 37°28′30″ on the pitch line, these taps could not be used as conventional taps—holding the work and rotating the tap into it. With the cutting face at so great an angle, the tap could not form its own lead. The same condition existed if the tap were used as a broach by pushing it through the work.

A fixture (Fig. 4) was therefore designed, for a push-broach machine, with a master lead bar to rotate the work in relation to the tap helix as the tap was pushed through the piece. In this fixture, the tap is held in a splined driver bolted to the machine ram. The work is held in a central ring and clamped by serrated jaws that are given the same clamping pressure by an equalizing ring.

This ring has the two jaws set opposite each other in slots. As the setscrew is tightened, the pressure is transmitted equally by the ring to the opposite jaw as well as direct to the jaw by the screw. The equalized pressure insures that the part will be located centrally in the recess.

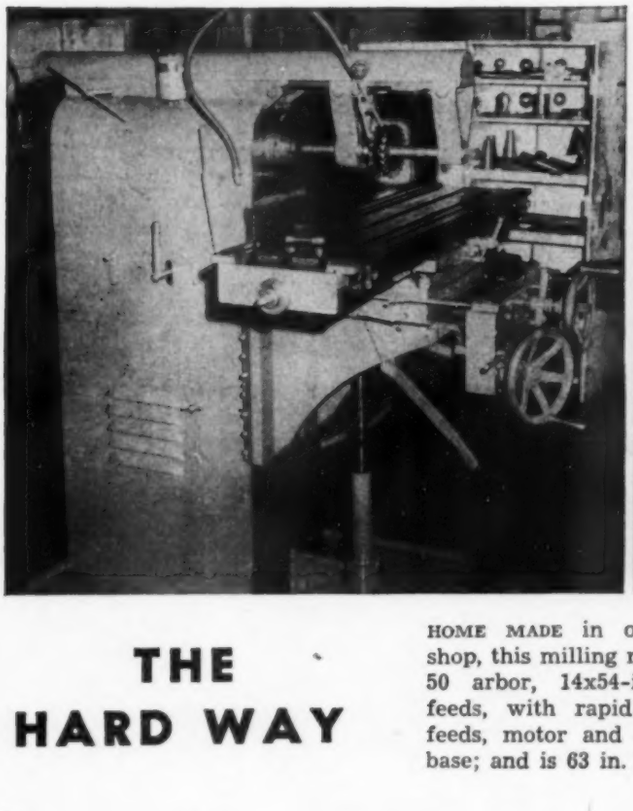
If the clamping pressure were not equalized between jaws, threads cut in different pieces of work would vary with their O.D. The fixed jaw in that case could be set accurately for only one size of work and would be in the wrong position for all other sizes. Accordingly, rejects would be high and taps might easily be broken.

As the work must rotate when the tap is pushed through it, a master lead bar is geared to the workholding fixture. Its upper end is passed through a nut mounted on the machine ram and the nut thread is formed by pouring hard babbitt around the bar thread after the bar is aligned accurately.

The lower end of the bar is attached to an arbor which is keyed to a spur gear. This gear is meshed through an idler with a third gear that is pinned to the ring into which the work clamps are nested. All three gears are mounted on ball bearings to reduce drag. To insure continued accurate alignment of the lead bar, the bracket holding its lower end in position is babbitted and bolted to a V-shaped surface.

As the machine ram descends, the ram-mounted nut causes the lead bar to turn. This rotates lead-bar, idler and work gears so the work also is rotated at the same rate as would the tap if it were being threaded into a stationary workpiece.

Production rate on the job is satisfactory, being 12½ min. floor-to-floor time, as compared to 5 hr. for chasing in a lathe as was done on the first experimental power feed nuts. The lubricant used is a mixture of lard oil plus 10% kerosene. Down traverse speed is held between 22 and 25 fpm. while the machine pressure is maintained from 4 to 4½ lb. Operation at 5 lb. or more dulls taps too rapidly and reduces tool life unnecessarily and unduly.

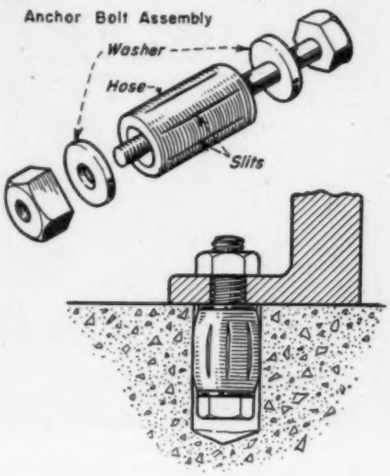


THE HARD WAY

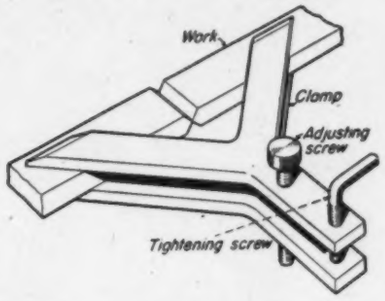
HOME MADE in one-man machine shop, this milling machine has a No. 50 arbor, 14x54-in. table, power feeds, with rapid traverse on all feeds, motor and coolant pump in base; and is 63 in. high. Builder, H. H. Scanland, who runs the North Kansas City Machine Shop in North Kansas City, Mo., declares that it took 18 months to make, and while he is proud of it, and glad he built it, he won't again tackle so big a job.

Short Cuts FOR THE SMALL SHOP

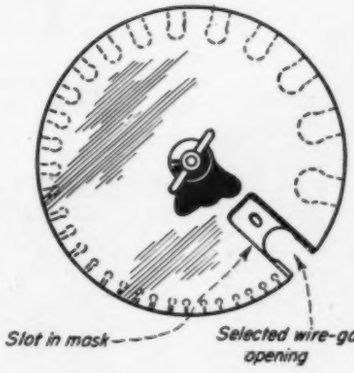
BY A. H. WAYCHOFF



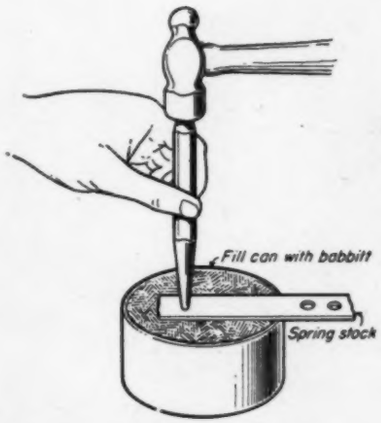
TEMPORARY anchor bolts for machines are easily made by putting a piece of old hose over the screw. Cut five or six longitudinal slits in the hose. When the nut is tightened, the hose will swell to a barrel shape and grip the wall of the hole drilled in the foundation or floor. But when the machine must be moved, the anchor bolt can be taken out quickly.



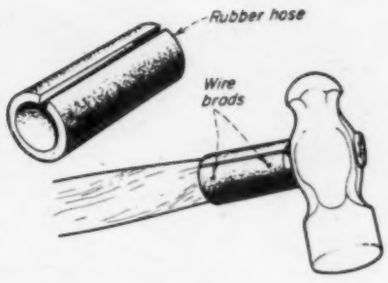
A 2-WAY CLAMP is useful for holding flat bar stock in alignment for welding. Torch cut two Y-shapes and grind the edges smooth. At the center, drill and tap both parts for an adjusting screw. Drill and tap a hole in the leg of one shape for a tightening screw, preferably of the lever type.



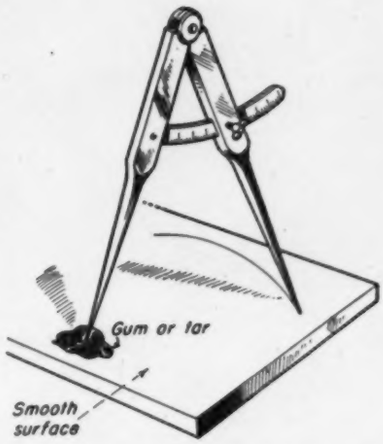
FOR DUPLICATE measurement or sorting of wires of a specific size, it is handy to block out all of the wire-gage openings except the one wanted. In this case fasten a disk with a single slot to the wire gage, using a thumbscrew. Set the slot to the desired gage.



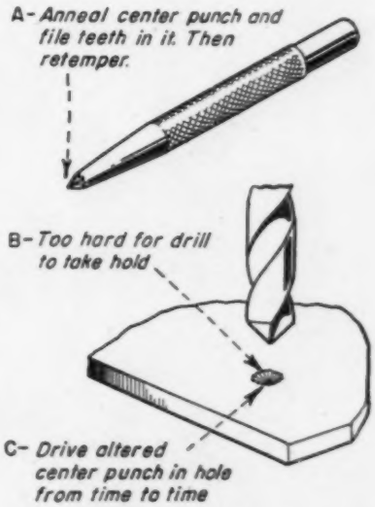
SPRING STOCK can be punched without fracturing it, if backed up with a material like babbitt instead of hard wood. Fill a coffee can with babbitt, allowing the top to run full and smooth. Lay the spring stock on the babbitt surface and use a punch with a square end. A sharp tap with the hammer will knock out a disk neatly and slightly embed it in the babbitt. Do not try to punch holes close together.



HAMMER HANDLES are quickly roughened and splintered near the head by misses, if the user is not expert. To avoid this damage, glue or tack a piece of split rubber hose under the head.



TO SCRIBE a circle on highly polished or smooth work that must not be prick-punched for a center, place a daub of tar or gum at the approximate center. Put the point of the dividers down at the desired spot and scribe the circle.


A- Anneal center punch and file teeth in it. Then retemper.
B- Too hard for drill to take hold
C- Drive altered center punch in hole from time to time

HARD SPOTS that the drill won't bite into can be overcome in this fashion. Anneal the point of a center punch, file teeth on the point, and reharden. Now put the punch in the hole, strike sharply with a hammer. This creates a rough spot so the drill can get a bite. The process may have to be repeated.

Five Locomotives Per Day . . Here, in the locomotive assembly area of the 54-acre La Grange (Ill.) plant of the Electro-Motive Division, General Motors, five diesel locomotives are assembled per day. Some 70,000 parts go into each. More than 3,700 of these locomotives are now in American service, totalling almost 5 million hp. Other photos show typical machining operations

SHOP SHOTS
AT ELECTRO-MOTIVE

All Crankcase Welding Is Down-hand . . Two 16-cyl. crankcases are mounted on positioners for higher-speed welding of superior quality. Heavy-coated deep-groove electrodes are used, in four sizes (5/32, 3/16, 7/32 and ¼ in.) and three AWS classes, for a total of 628 lb. per unit. Both ac and dc. welding are done, with 300- to 500-amp. machines. Welder at left is welding reinforcing corner block to base rail and to end plate; welder at right applying gusset to base rail air-box stress plate

Air Chucks Hold Liners for Boring . . Cylinder liners of alloy cast iron are bored to 8.456-in. in a 2-spindle vertical boring machine. Located on previously turned and faced surfaces, the 165-lb. liners are held in fixtures by air chucks. Six carbide-tipped blades in each boring head, fed at 6¼ ipm., rotate at 62 rpm. Pieces are brought to, and taken from, the machine on a roller conveyor passing in front. A removable conveyor section permits access to the machine for tool setting and the like

Exhaust Decks Are Slab-milled . . Crankcase exhaust decks are slab-milled in a 3-head miller with 9-in. dia. x 12-in. face inserted-blade helical cutters. Roughing at 10 rpm. and 3½ ipm. feed is succeeded by finishing at 36 rpm. and 4 ipm. (shown) in the same machine. The crankcase, weighing about 9000 lb., is of SAE 1020 welding-quality steel

24 Tools Machine Cylinder Heads . . The 160-lb. cylinder head is bored, turned and faced in a 6-spindle chucking machine at speeds from 46 to 54 rpm. and feeds of 0.008 to 0.016 ipm. Work is located from faces previously machined in a similar unit. Most of the 24 tools are carbide-tipped. Work is brought from and returned to the conveyor by electric hoist

Four Heads Mill At Once . . Handhole extrudes and pan-rail surfaces on both sides of the crankcase are milled in a single pass through a 4-head miller. Extrudes are milled by 16-in. face-milling cutters, rail surfaces by 12-in. Cutter speed is 10 rpm., feed 3 ipm. The crankcase is inverted for the operation. Material is SAE 1020 steel

TALKING SHOP

Heavy Metal

RECENTLY one of our editors found himself holding a piece of pure uranium. It is dark bronze in color, normally oxidizes on the surface to a dull black, has a relatively low melting point. Looks harmless. Although it was probably psychological, our man says his fingers tingled for about five minutes after he put it down. A few grams of pure uranium were obtained as long ago as 1920 by the Lamp Division of Westinghouse at Bloomfield, N. J. They were looking for improved filament materials; discovered they couldn't use uranium—too radioactive for their purposes.

Mass Inspection

WHEN SLAYMAKER LOCK CO. redesigned its foundry layout for higher production, engineers changed the inspection system. Castings are left attached to the gate until cleaned and inspected. About a dozen lock bodies are included on a single multiple. After cleaning, the group is inspected—usually an entire set is sound or defective. Rejected multiples are already cleaned, can be returned at once for remelting. This method saves a lot of handling in inspection.

Better Mousetraps

FOLLOWING EMERSON'S EDICT, we recently beat a path to the door of the Animal Trap Co. of America. (This past winter being what it was, it took a pair of boots and considerable beating.) Secret of the mousetrap is an ingenious machine that turns out 50 completed traps a minute, makes it possible to retail them at three for a dime. Unless we decide to go into the mousetrap business, which is unlikely, the secret is safe with us.

Steel game traps are made by more conventional methods, mostly involving punch presses. As rapidly as possible, ATCOA is replacing ancient equipment with new high-speed presses and automatic feeds.

Plastic traps are molded by a battery of unattended injection-molding machines with plastic material hopper-fed from the floor above. If a machine jams, a light flashes in the next department; the setup man comes over to clean up the trouble from them.

Tarnish

SILVER may be a poorer electrical contact metal than others in some cases, says B. W. Jones of G. E. The two vital factors in contact materials are thermal capacity and oxidation. Silver is relatively poor in the former, thus may tend to vaporize and explode when interruping large currents. In his opinion, silver is best for interrupting small currents, but for very large ones—as in short circuits—tungsten may be better because of better thermal capacity.

Back to the Farm?

A YEAR AFTER one firm moved from New York City to a small town in another state, executives report they are highly pleased. Materials can be purchased more cheaply, labor costs are lower, and employees take a greater interest in their work. This company is in a highly competitive business, and its position has been much improved by the change. The few top men who made the move like being able to get home in a few minutes.

Color

YELLOW-ORANGE has been the color on equipment and walls to dado height at Worcester (Mass.) Pressed Steel for 35 years. Founder John Higgins selected the color, has seen to it that new equipment was delivered unpainted or in proper color. In recent years, red has been used to signal fire, with diagonal silver stripes for alarms and extinguishers, horizontal green stripes for flammable materials. Blue distinguishes high-voltage equipment.

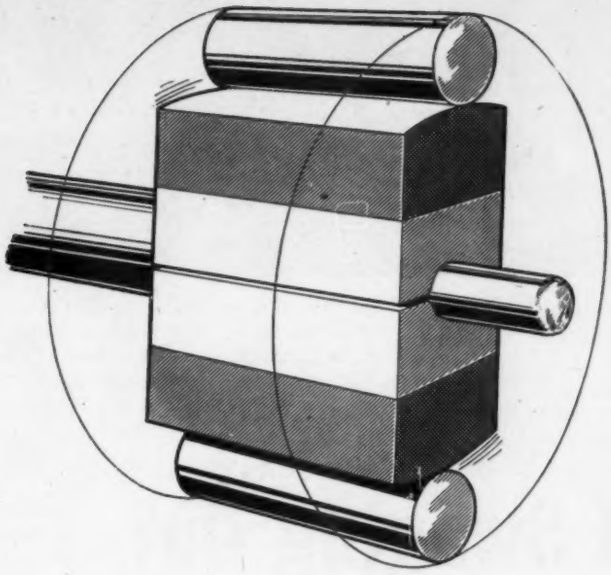
Tuff Stuff

LIGNUM VITAE, the world's hardest wood, possesses excellent bearing properties, and in roll-neck bearings will outlast brass 10 to 1. As 30% of its volume consists of natural gum, it may be run dry, or with water as a lubricant. It is odorless, tasteless, non-oxidizing, and incapable of contamination. A sliver in the finger will not fester. Apart from its use as a bearing, it is made into tiny mallets for jewelers, hammers for straightening auto fenders, and huge mauls for shipbuilders, squeakless pulleys for venetian blinds, pestles and mortars, muddlers for "old fashioneds," and, of all things, artificial chestnuts. These are balls, about 1-in. diameter, with a hole through the center; they are made into a bracelet for a horse's leg to keep him from kicking himself when he is being taught to trot. At one time, real chestnuts were used, but the lignum vitae seems to work better and last longer.

Too Good

YOU MAY HAVE HEARD of the automotive chief engineer who, some years ago, rejected a design for a new horn button. The design would cost about $12 apiece to produce; a stock equivalent cost 36 cents.

Latest case like it we've heard about is that of the engineer trying to get a rotor to operate at speeds above 50,000 rpm. Despite his best efforts with precision bearings, the rotor always froze. An old timer finally suggested a way out: use commercial ball bearings. They worked beautifully. The precision job was too good for his purpose.



How and When to Swage

BY ANDERSON ASHBURN ASSOCIATE EDITOR

SWAGING is well known for certain specialized jobs. Perhaps it is too well known, because many production men still believe its only application is to these limited fields. Actually rotary swaging can save both time and materials on many tapering, forming, reducing, and assembly operations with round work. In addition, the hammering action gives desirable qualities of grain flow, surface finish, and tensile strength. This special report explains the process, discusses advantages and limitations, and summarizes current practice.

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

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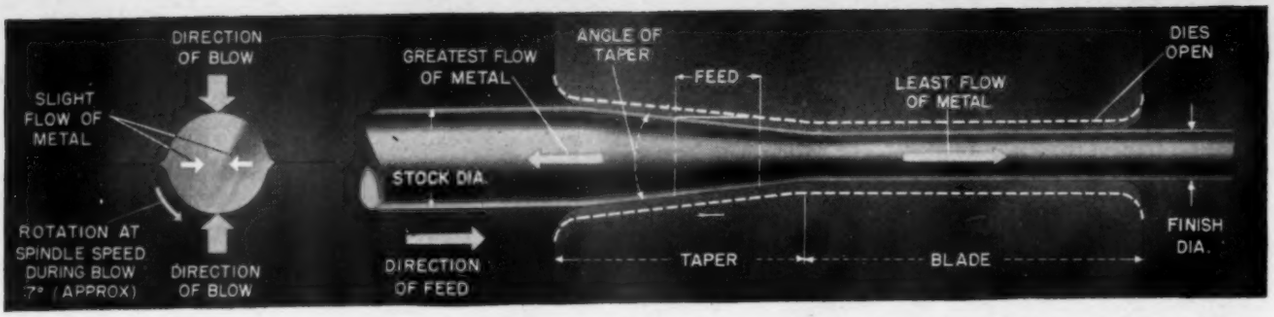


Action of the metal when swaging solid work. In tube swaging without a mandrel part of the metal flow is inward, increasing the wall thickness of the tube. The flow of metal backward out of the dies is known as "feed-back" and should not be confused with kick-back caused by slippage between work and dies.

What Will Swaging Do?

ROTARY swaging is a process of shaping work with many blows applied by rotating dies. The dies (two dies in most cases, but four dies on some large machines) reciprocate rapidly as the spindle in which they are mounted rotates. This means that the finished work must be round. Within this limitation, swaging is applicable to a wide variety of pointing, tapering, reducing, sizing and assembly operations.

Work can be swaged either hot or cold, but it is done cold whenever possible because of the greater ease of handling and the superior finish.

The minimum possible finished diameter of swaged work is limited by the size that will remain in the die groove without slipping out into the space between the dies when they are in their outer position. Work as small as 0.015-in. dia. can be swaged with only a little trouble in this way, but a better minimum is 0.020 in.

The maximum possible finished diameter is limited only by the size of the machine available and will involve such factors as the material, the amount of reduction, whether solid or tube, and whether the operation is done hot or cold. Machines are generally available which are rated up to 6-in. dia. for tubing; a few have larger capacity. Solid-work capacity is about half that for tubing.

Because swaging is a hammering operation, it has the same beneficial effect on work as forging. It produces a desirable grain structure and results in increased tensile strength and elasticity. Cold swaging work hardens most materials. Hot swaging usually does not have as much effect on material characteristics, but will result in improvement of the grain structure. In fact, brittle materials, such as tungsten, develop enough elasticity after repeated hot swaging to permit drawing.

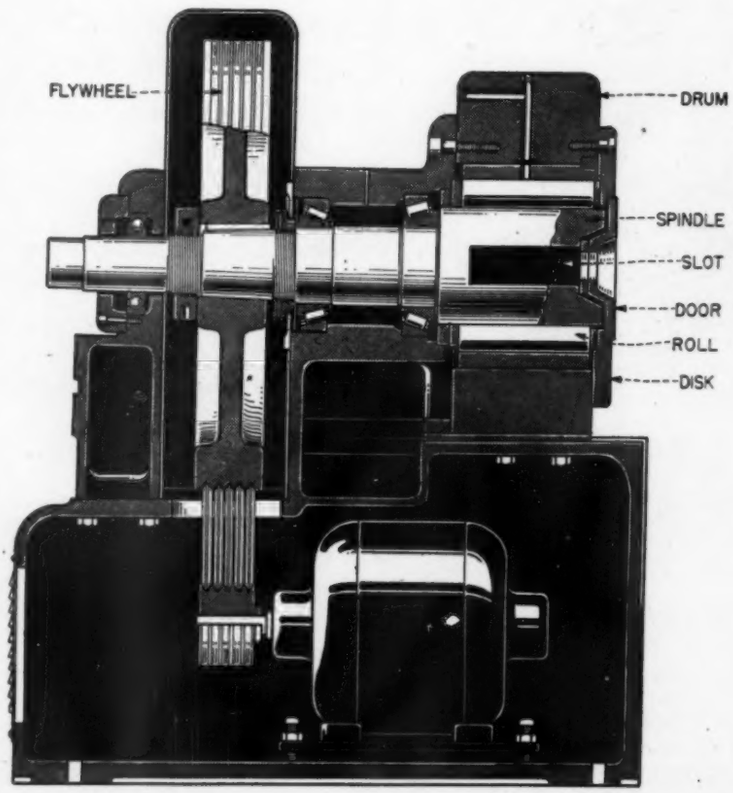
Another major advantage of swaging is the conservation of material. The metal is shaped by hammering, and there is no waste except on jobs which require trimming on one or both ends afterwards.

Swaging is fast, requiring only a few seconds for most operations. Little skill is required to operate a swager.

Plated work can often be swaged without breaking the plate. For example, it is possible to swage gold-plated parts without loss of plate.

The degree of accuracy depends on the condition of dies and machine and on the size. As an example, solid work of ¼-in. dia. could probably be swaged to plus or minus 0.001 in.

Limitations, aside from those on size already mentioned, include the limits on angles and lengths of taper. Sharp tapers or swaging close to a shoulder on the work is difficult.



Section through a typical swaging machine. Dies and backers have been removed from the spindle slot

The length of a taper that can be swaged in one set of dies is limited by the design of the machine (that is, by the length of the dies the machine will take).

When tubing is swaged, wall thickness is increased unless the tubing is worked over a mandrel. The mandrel slows down production, and may interfere with work removal.

Swaging Machines

Although there are variations in makes and sizes, all swaging machines have essentially the same construction. Among principal variations between makes are flywheel location (on some it is at the center of the spindle, on others it is at the rear) and the type of bearings on the spindle.

Slots are provided in the spindle face for dies and hammers or backers. Hammers have a flat face in contact with the dies and a rounded end or a slot containing a roll that protrudes from the slot in the spindle. Around the spindle are a group of hardened steel rolls. As the spindle rotates, these rolls strike the rounded protruding section of the backers and drive them against the dies.

On some machines, the rolls are carried loosely in a cage. As the spindle revolves rapidly, the cage rotates slowly. It is moved by the planetary action of the rollers during the time they are in contact with the hammers.

Some machines do not have a roll cage that is free to rotate; others omit the cage entirely. In the latter case, the rolls are designed to fill the annular space between spindle and head.

A disk or faceplate fits over the front of rolls to hold them in place. An opening in the disk is large enough to permit removal of dies and backers. The spindle is hollow so work can be fed through the machine.

Small machines have a plate (die cap) which fits over the end of the spindle to retain the dies. Larger machines have a door or gate for this purpose.

In either case, the backers may be held in place by plates or a ring (spindle cap) fastened to the end of the spindle or there may be a solid-spindle design that holds them behind the end of the spindle. There will be backer bolts on smaller machines which are used to limit the amount of die opening. A pin on the back of the plate or on the backer bolt fits in a hole of larger size in the backer. Plates are attached to the spindle through elongated holes so that their position can be adjusted. Backer bolts pass through elongated holes in the spindle cap, permitting similar adjustment.

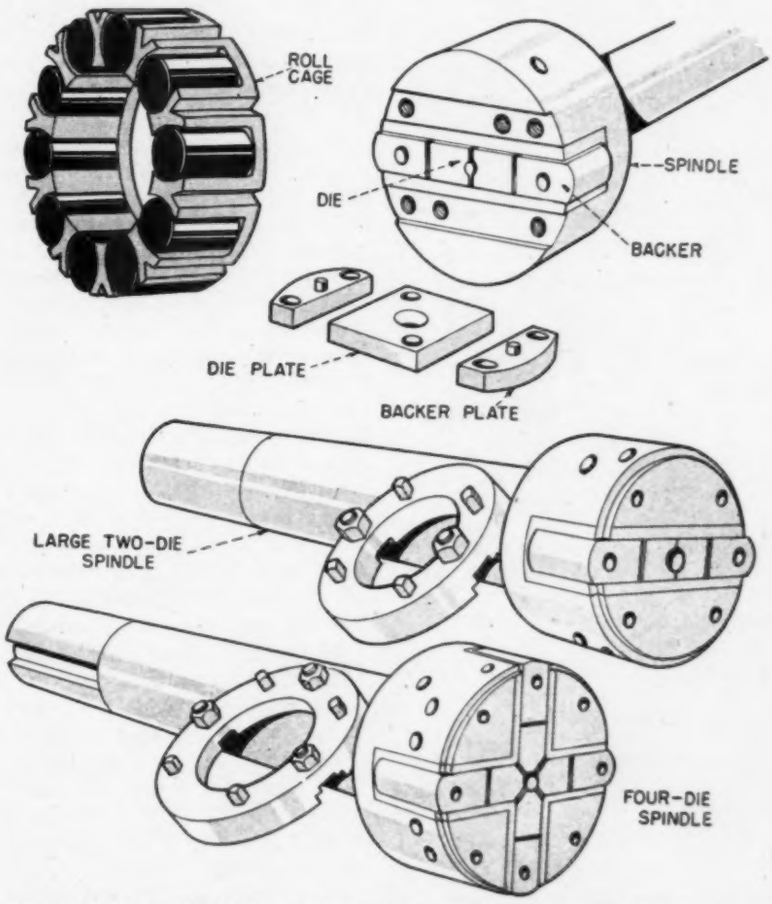
Four-die machines are designed in the same way as two-die machines, except that there are two slots at right angles in the spindle head.

The drum or head on some machines is drilled for the circulation of cooling water. Some engineers feel that cooling is sometimes desirable on large work that is swaged cold, and is essential on hot work. Others feel that cooling is almost never desirable. Especially in large machines, work hardening of rolls and hammers may be a serious problem. When a machine runs hot, there is less trouble with this.

Some machines have an oil tank and gear pump to lubricate the work and dies during swaging. One recommendation is to use half kerosene and half light machine oil. The kerosene cuts down on slipping caused by the oil.

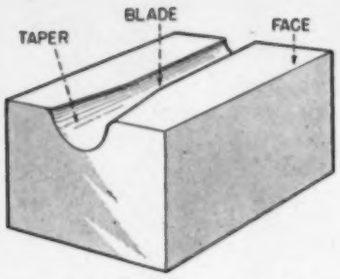
When swaging is to be done on a central section of the work, the ends of which are larger than the normal die opening, some means must be found for getting the work through the dies before swaging. One method is to remove one die, insert the work, replace the die, start the machine, swage the work, stop the machine, remove one die, and remove the work.

Although this method is perfectly practical, and actually not as slow as it sounds (if the machine has a brake), it does seriously slow the rate of production. For this reason machines have been developed in which the dies can be opened to permit the insertion of large work while the machine is running. This is done by wedges between dies and backers which are withdrawn to open the dies and inserted to close the dies. The wedges may be shifted either mechanically or hydraulically.

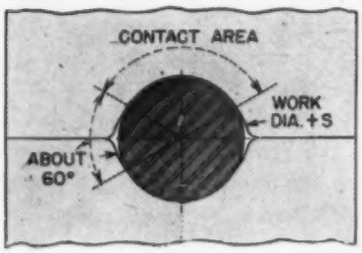


Construction features of typical swaging machines. A heavy flywheel is always mounted at the center or rear of the spindle

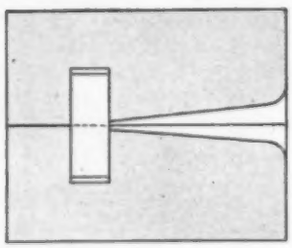
Swaging Dies

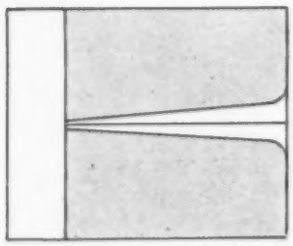


Typical swaging die with both tapered and straight sections

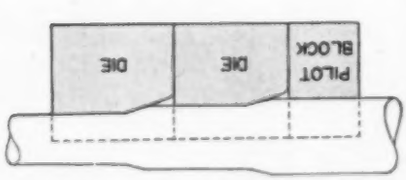


Die oval is determined by amount **S** which dies are blocked apart during finishing





Stop blocks for pointing operations may be either fitted into slots in the dies or placed behind dies in the spindle



Multiple dies and pilot block for swaging two tapers on work in one operation

Swaging dies are of simple rectangular shape with size to suit the machine in which they will be used. Typical dies will have a straight groove or blade and a tapered approach. Other dies may have a taper all the way through or a cone-shaped cavity only part way into the die. For most work the dies are made with a slight oval in the cavity rather than with a round cross-section.

Die materials vary widely. For most cold swaging, high-carbon steel will give excellent results. One recommendation is for 1.40 C. on small dies and 0.90 to 1.00 C. on the medium sizes. For larger dies another firm recommends 0.55 to 0.60 C. manganese steel. The higher carbon does not harden as deep on small dies will thus have a tough core. Lower carbon may split as the result of through hardening.

Dies are hardened to a depth of about 9/64 in. with a surface hardness of 62 to 64 Rockwell C. for small dies, 58 to 61 for larger dies. If carbon steel dies are harder than this they are likely to split. The steel should be of a type that will give a gradual change of hardness between case and core.

Light alloy or high-speed steels may be used for dies which are subject to heavy wear, especially in small sizes. For hot swaging, alloys or low-carbon steel with a hard-facing material applied are common. Carbide gives excellent results in hot swaging difficult materials such as tungsten and molybdenum. Carbide inserts are used on large dies, but the small sizes are usually better with solid carbide. Carbides should be of relatively tough grade with a high percent of cobalt. Carbide has also been used with success in cold swaging, and is reported to give good results if the machine is set up and operated properly.

When the die cavity is less than 1/16 in. in diameter, die blocks are usually hardened first, then the cavity is ground in each die of the pair. A pair of die blocks should be produced as a pair and marked so the two dies will always be used together. When the die cavity is too small to permit production with the dies clamped together, all operations should be located from the same face of the dies so the two halves of the cavity will not offset.

Dies with cavities from about 1/16- to ¼-in. dia. are clamped together with the outer surfaces carefully aligned and the groove is drilled and reamed, or bored, leaving 0.005 to 0.010 in. for finishing. After the dies are hardened, they are lapped to size.

With larger sizes the procedure is similar, except that it is possible to finish by internal grinding. On large dies the groove is more likely to be cut by milling, however, then finished by grinding.

An oval opening (called simply "oval") is required for most work so dies will not split under the high pressures encountered. Oval is obtained by placing shims between the dies during processing and increasing the diameter to which the dies are finished by the thickness of the shims. When the shims are removed, the groove is of the correct diameter in the direction of die travel but is large (by the amount of shimming) at right angles. This amount of oval is increased, in practice, by rounding the die corners. On very small dies, rounding the corners sometimes gives all the oval required.

More oval is required in the taper than in the blade, so the dies must be shimmed different amounts for these operations. The radius between taper and blade must then be skillfully blended into the straight sections.

Condition of dies can be determined by visual inspection. If maximum life is to be obtained from dies, they should be inspected frequently and repaired before wear is far advanced.

All of the reduction takes place in the tapered section of the dies, with final sizing taking place in the blade section. This means that most of the wear takes place in the taper. An annular groove may develop in the taper at the point where the work first contacts the dies. This groove will make feeding difficult. At the first sign of such a hollow, dies should be refaced.

When dies are new they do not contact the work near the edges of the die because of the oval. The area of contact in used dies is evident from the burnishing effect of the metal flow. As dies wear the area of contact increases. It should not approach nearer the face of the die than about ⅛ of the groove di-

DIE OVAL for CABLE TERMINALS

Courtesy American Chain and Cable Co., Inc.

CABLE DIAMETER INCHES	AMOUNT OF BLOCKING INCHES
1/16	0.011
3/32	0.015
1/8	0.017
5/32	0.020
3/16	0.025
7/32	0.030
1/4	0.035
9/32	0.040
5/16	0.045
3/8	0.050

ameter. If it does (with too little oval in the dies as a result), the dies are likely to split. It is estimated that 90% of swaging die breakage results from failure to maintain proper oval in the dies.

When dies are only slightly worn, they can be repaired by lapping. Greater wear may require regrinding. If wear has progressed too far, the dies must be annealed, about 1/16 in. removed from the face, and the grooves remachined.

When grooves are redressed by lapping or grinding, the face of the dies must also be redressed to remove the same amount of material. After dies have been redressed about five or six times, it is necessary to anneal and remachine them because the limit has been reached on the amount of hardened steel it is advisable to remove. About three machinings is the limit possible with most dies before they should be discarded.

DIE DESIGN

Selection of taper is one of the principal factors in die design. When the finished work is to have a taper, the angle will be determined by the work. When the taper is only a means to bring about the reduction in the work, considerable latitude is possible.

In the swaging of tungsten wire dies were once common which had, for all practical purposes, no taper at all. These were called chopper dies and the name is a good indication of the condition in which they left the work. Much larger bearing length, or blade, is now common on such dies, although taper is often omitted still. Better surface finish results, but it is still not as good as that possible with a gradual taper blended into the blade.

For reducing tungsten, the preliminary dies may have a blade length 1½ times the work diameter. Finishing dies have blade length about three times diameter and have a carefully rounded die entrance.

For cold swaging on solid work, when hand feeding is employed, it is desirable not to exceed 8° of included angle in the taper. This amount can be increased to 12 or 15° in some cases, but it is more important in such cases that the work be free of oil. On large work feeding devices are customary and tapers as high as 20° are possible. Higher tapers can sometimes be handled with the aid of feeding devices. The possibility of breaking such reductions down into two or more separate operations should always be considered.

Somewhat steeper tapers are possible with tubing. Copper tubing has been swaged with tapers as high as 34°.

Whenever long, thin tapers are to be produced, care must be exercised not to exceed the capacity of the machine. The maximum length of taper on solid work is limited not only by the die length of the machine, but by the requirement that the length of taper must not exceed ten times the average diameter. Longer tapers can be swaged in successive operations.

If work is to be pointed, the most desirable arrangement is to have a small groove all the way through the die from the end of the taper. This groove should preferably be at least 0.015 in. in dia. The final point can then be applied by grinding.

An alternate method is to taper the work to about 1/32-in. dia. and then insert a stop block or key. In practice this key may either be inserted in slots cut in the dies or the dies may be made short and a stop block cut to the same size as the dies placed behind them.

Multiple tapers are difficult to swage with one set of dies. The problems in producing the dies to specifications are great, and the problems of refacing dies without changing the relation of the tapers are likely to be greater. In many cases, the best arrangement is to break the swaging operation down into two or more sets of dies. If a close tolerance is required in the relationship of the tapers, this is not always possible.

OVAL IN SWAGER DIES

Courtesy The Torrington Co.

AMOUNT OF BLOCKING FOR SOLID WORK

DIAMETER	ALLOY STEEL, DRILL ROD	LOW-CARBON STEEL	HARD BRASS	COPPER	LEAD
3/4	—	—			
11/16	—	—			
5/8	—				
9/16		TAPER 0.001 in. per deg. of taper plus 0.5% of max. dia.			
1/2	1.25 times value at right				
7/16		BLADE Value for taper less 0.003 to 0.004 in.			
3/8					
5/16					
1/4					No Blocking
3/16	2%	of average diameter			
1/8	4%				
1/16	3%				
1/32	Stone edges of groove				

AMOUNT OF BLOCKING FOR TUBING

Ratio of O.D. to wall thickness	Blocking Required
25 or over	None
10 to 24	60% of solid
9 or less	100% of solid

NOTE: Corner radius on the groove should be 1/16 of blade diameter to nearest 0.005 in. or equal to thickness of tube.

Multiple tapers can be produced with relative ease in many cases by mounting two or more sets of dies in the machine at once. When this is done, one taper is swaged by each set of dies. Such dies are relatively easy both to make and to reface. Concentricity between the tapers can usually be held to plus or minus 0.002 in. on ¼-in. work in multiple dies. On ½-in. work it is likely to be plus or minus 0.003 to 0.004 in. If pilot blocks are placed ahead of the first set of dies to guide the work, even closer concentricity is possible.

Pilot blocks, for applications like that just mentioned, can be included in almost any die setup to improve the concentricity or to insure straight feeding. They are simply a pair of blocks machined to fit in the die space in the spindles. (Dies must be shortened by the thickness of the pilot blocks.)

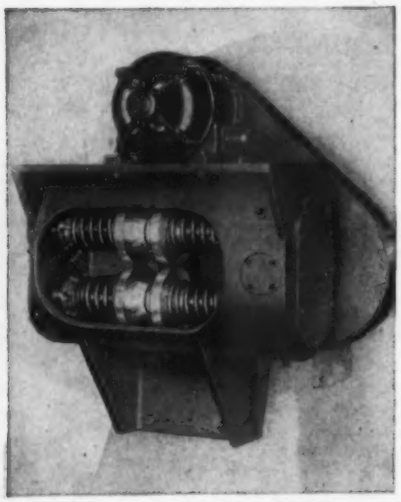
The amount of oval in the dies will be determined by the material, size, and amount of taper. When swaging lead, no oval is provided. More oval is necessary for alloy steels than for mild steel or brass. More oval is necessary in the taper than in the blade. More oval relatively is necessary for small work than for large work. More oval is necessary for solid work than for tubing.

Aside from these general principles, there is wide divergence in the recommended amount of oval, with suggestions ranging from 2 to 15% of the diameter of the work before swaging as the amount of blocking required when applying the oval. The table shows the method employed by one firm for calculating oval. These values are the result of long experience with a wide range of applications.

DIE OPENING for CABLE TERMINALS

Courtesy American Chain and Cable Co., Inc.

CABLE DIAMETER INCHES	MAXIMUM DIE OPENING INCHES
1/16	0.016
3/32	0.021
1/8	0.025
5/32	0.030
3/16	0.036
7/32	0.042



Roll feed can be mounted on either end of the swager when work is to be fed continuously through the dies

Design of four-die sets is essentially the same as for two-die sets except that no oval is provided. Die corners are rounded .

Four dies should not be used when finished work is less than 3/16 in. in dia. Usually four dies are not advisable unless the work is considerably larger than this minimum and fine finish is not required. Four dies work metal less than two dies. Hence they are of more advantage with metals such as brass which can stand less working.

Operating Procedure

In setting up the swaging machine it is necessary to select shims of suitable thickness to apply the right pressure when the backers contact the rolls and to adjust the backer bolts to give the correct limit of die opening.

The procedure is to insert dies, loosen both backer bolts, and estimate the thickness of shims required. Shims of equal thickness are then placed behind each die and the flywheel turned by hand to roll the spindle through a blow. It should be possible to do this by hand without undue effort. If no resistance is felt, thicker shims are required. If too much resistance is felt, thinner shims are required.

When proper die pressure is established, through the adjustment of shims between dies and backers, the maximum die opening must be set on small machines. The factor that will usually determine this is the included angle of taper in the dies. One recommendation is for 0.001 in. of opening for each degree of taper. There is no adjustment for die opening on large machines.

With the backer bolts loose, the spindle is rotated until the backers are free of the rolls. A shim with thickness equal to the maximum opening desired is placed between the dies, and the spindle is rotated against a pair of rolls, forcing the dies against the shim. With the spindle held in this position, backer bolts are moved as close to the spindle as possible and then tightened. The flywheel is backed up to relieve the blow and the shim is removed.

Lubrication is required on the sides of the dies but is undesirable in the cavities except in those cases where an oil tank is employed. To accomplish this, a grease that will not creep is essential. Such lubricants are available commercially in different grades. A thin grade is applied to the sides of the dies and a heavy grade is applied to the rolls.

For nearly all small work, a hand feed is fastest and most desirable. The work must rotate during the period the dies are closed, but must be restrained during the period the dies are open so it will not rotate steadily at spindle speed. The best way to apply this resistance is by hand.

A slow, steady feed is best. For most work, the rate will range from ½ to 1 in. per sec. It is important to feed work straight into the machine. Large work started at an angle may get out of control and the outer end may wheel around, injuring the operator. Guides or pilot blocks may be necessary to insure correct feeding.

For work that is too large to feed by hand or that has too steep a taper for easy feeding, a feeding device can be used. Feeds can be mechanical (rack and pinion or roll), hydraulic, or a combination of pneumatic and hydraulic. Straight pneumatic feeds will work if tolerances are not too close. On many smaller feeds, the work is pushed by the feeding device but is restricted in rotation by the operator's left hand. Sometimes a holder for short work will have a light friction grip that supplies the resistance to rotation. In this way, work can be fed that is too short to grip in the left hand. A spring ejector must be installed to push the work out of the machine because the feed chuck will not hold tightly enough to pull it out. Larger feeding devices sometimes grip the work tightly in a chuck free to rotate.

Restraint is then supplied by a friction clutch and no ejector is required.

Hydraulic feeds are built with automatic cycles which clamp, rapid advance, feed, dwell, rapid return, and unclamp.

Dirt, scale, or chips must not be allowed to accumulate in the head of the swaging machine. At intervals which will vary with the nature of the work, dies, backers, rolls, cage, and related parts should be removed for cleaning and lubrication.

Work to be swaged hot may be heated in a box furnace or passed through a heating tunnel or muffle directly into the swaging machine. Induction heating instead of a muffle is not as hard on the machine. The principal factors determining which method is used are the diameter of the work and the heat required.

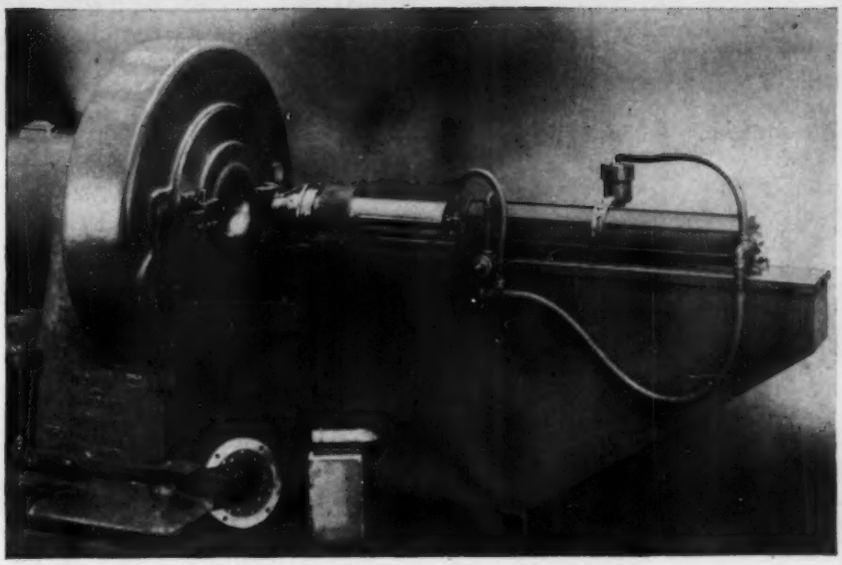
In swaging tungsten and molybdenum ingots, for example, common practice is to heat them in a furnace. Only half of an ingot can be swaged on one heating. For tungsten, the end is heated to about 1550 to 1600 C. and about 12% reduction is possible. As swaging operations continue, the material becomes more ductile and lower temperatures (about 1000 C.) are possible. Also the ingot increases in length as it is swaged and becomes unwieldy.

It is then started by hand through the muffle and adjacent swaging machine to feed rolls on the far side which pull the remainder of the ingot through. After the ingot has been reduced in this way to about 0.015-in. dia. a graphite lubricant is applied. Further reductions are made by swaging until the diameter is reduced to 0.060 in. When finer wire is required, it can be drawn because of the fibrous grain which has developed during swaging.

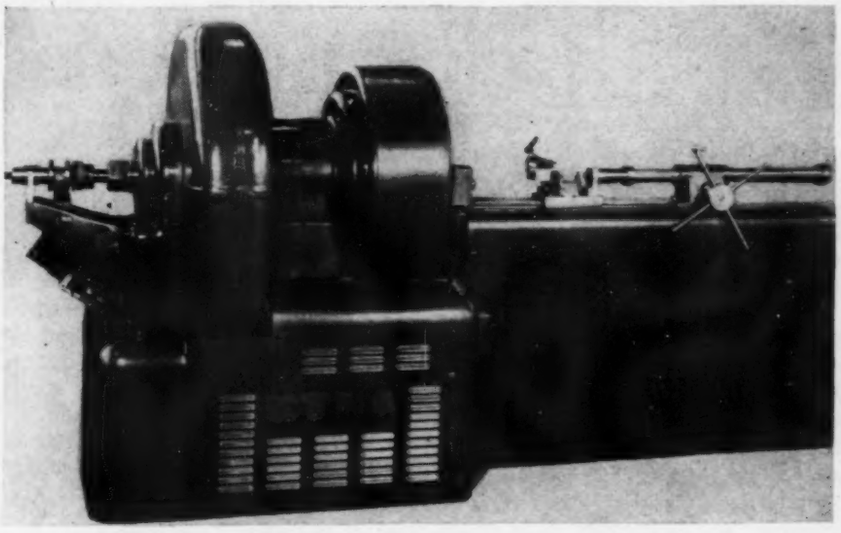
Concentric assemblies can be made by swaging as in the application of ferrules to brushes or tubing, the attachment of terminals to aircraft cables, the application of a case to lightning rods, and the assembly of certain types of heating elements.

In all assembly operations, the technique is to lengthen and reduce the diameter of the outer element by swaging until it is firmly attached to the inner one. The strength of this bond is determined by the size and strength of the outer member, or ferrule, in nearly all cases.

Aircraft terminals, for example, have a heavier wall than most swaged assemblies. With a properly swaged terminal, the cable will break before the terminal will pull loose.



Airdraulic feed has speed controlled by lever or pedal. Friction clutch restrains rotation of work



Rack and pinion feed attached to one type of swaging machine. Mechanism at left is for opening and closing the dies

With any assembly, it is best if the parts fit tightly enough to hold their position before swaging. When this is the case, the procedure is simple. Stress calculations must be on the basis of solid work but dies should have less oval than normal (about halfway between tube and solid) to insure a tight joint.

If terminals are fitted to wound cables, the spindle should rotate in the direction of winding. Swaging machines for those applications are equipped with a brake and a reversing switch .

When a tube is swaged, the walls must be thick enough to stand up under the compressive stress. If they are not, the tube will wrinkle.

When it is necessary to use a mandrel to maintain wall thickness or to prevent wrinkling, special care must be given to the production of the mandrel. A taper on the mandrel, even a slight one, will make it much easier to remove the finished tube.

Small mandrels can be made of music wire; larger sizes are carbon drill rod hardened and drawn, then ground and polished. Polishing should be lengthwise and must remove all grinding marks. Even polishing marks at right angles to the axis of the mandrel make it difficult to remove the work.

A **light** film of oil will increase the life of the mandrel and make it easier to remove from the work. If too much oil is applied it may get into the die grooves and cause kickback.

The mandrel should be mounted

with some flexibility so that it will not be broken if the dies should be slightly off center. The mandrel must be free to rotate with the work or it will twist in two.

Dies for mandrel swaging have more oval than for either solid or plain tubular work. Dies with a round groove will swage the work firmly onto the mandrel. The increased oval tends to leave the tube slightly loose on the mandrel. To compensate for this, mandrel diameter should be slightly undersize.

For small precision tubing, the mandrel might be 0.0005 in. undersize with a die oval of 0.004 in. On large work this might range up to 0.010 in. undersize with 0.020 in. oval.

When swaging tubing on a mandrel, the operation must be considered as solid work in selecting the swaging machine.

Swaging Difficulties

Difficulty in operation or defects in finished work may be the result of the condition of the swaging machine or dies, of improper die design or adjustment, of defects in the work before swaging, or of incorrect feeding. Some of the difficulties that are likely and their probable cause are:

Hard feeding. This is one of the most frequent problems and often results from oil or grease on the work. It is true that dies and work are sometimes flooded with oil during swaging, but this is usually confined to long, thin tapers (2 or 3°) on tubing. With sharper tapers, oil on work or die taper causes the work to kick back rather than feed.

The work may be too hard for proper swaging. As a general rule work for cold swaging should not be harder than 15 Rockwell C. for large work. Small work may be harder. Sometimes harder stock can be annealed before swaging, sometimes a more suitable material can be substituted, and sometimes it is necessary to hot swage.

The maximum opening of the dies may not be large enough. This can be corrected by readjusting the backer bolts. In other cases the die entrance may not be large enough to admit the stock or a hollow may be worn in the die taper. In either case the dies should be reworked to correct the difficulty. Dies may be worn to the point that the taper is round rather than oval. If this is not corrected the dies will split.

Long dents. Long dents or cuts in the work that are generally parallel and in the direction of feeding may result from sharp edges on the die groove or from too much die opening. Dies should have carefully rounded corners on the groove and adequate side clearance (resulting from oval). Too much die opening will result in feeding the work too fast.

Short dents or pits. Short dents generally at right angles to the direction of feeding are likely to result from poor blending of taper and blade in the dies.

Uneven dents. Small defects distributed unevenly over the surface of the work are the result of chips, scale, or dirt pounded into the surface. They can be avoided by cleaning out the head of the machine and using work that is free of scale or other material that might come loose during swaging.

Flashing. The development of flash on the work—usually in the form of straight fins but occasionally as light, spiral fins—is caused by too much die opening. It can be corrected by proper adjustment of the backer bolts. Flashing will also occur if the work gets stuck in the dies and rotates at spindle speed. This can be prevented by increasing die oval.

Peeling. Peeling of the work is the result of too much die pressure. The swaging length on solid work should not exceed ten times the average diameter or excessive pressure will develop.

Scouring. Scuffing marks around the work are most likely with aluminum and stainless steel. These materials have a natural tendency to pick up under pressure and special care must be taken in polishing of the dies. If a high-pressure lubricant can be used it will help. There must be no abrupt changes in dies—long radii should connect taper and blade. The die surface must be highly polished.

Cracking. Long cracks or breaks in solid material probably result from seams or pipes in the original stock. The only remedy is to use a better grade of stock. Short irregular cracks mean the material is too hard. If it occurs at one step in a series of swaging operations, the material has work hardened in the previous steps to the point that annealing is necessary. About 40% reduction of area is the usual maximum that is possible before material must be annealed. If the cracking occurs on the first swaging operation, the stock should be annealed or a grade more suitable for cold working should be substituted.

Wrinkling in Tubing. When tubing wrinkles or corrugates during swaging it usually means that the wall thickness is inadequate in relation to the diameter. The O.D. of tubing should not be more than 35 times wall thickness. The wrinkling can be eliminated by using a mandrel, but when a mandrel is introduced the capacity of the machine to handle the work must be checked.

Too much oval in dies may cause wrinkling in work which seems to have enough wall thickness. Sometimes a slower feed will eliminate wrinkling, if dies are not at fault. A slow, steady feed is essential with thin wall tubing.

Splitting in Tubing. The conditions that cause rough work when solid material is swaged may result in splitting when tubing is swaged. These include too much die opening, poor blending of taper and blade, chips, scale, or dirt on the dies or work, sharp die edges, or too much oval.

Wrong Taper. When work that should be straight has a slight taper, or work that should be tapered has too much taper, it is probably the result of too little shimming behind the dies. If shims are not responsible, it may result from faulty die design or poor condition of the swaging machine.

We Acknowledge . . .

The valuable assistance in collecting the data for this report given by the following firms and organizations.

American Chain & Cable Co.
Callite Tungsten Corp.
The Etna Machine Co.
Standard Machinery Co.
Sylvania Electric Products Inc.
The Torrington Co.

ROUND TABLE

Is Blue Monday Inevitable?

"Al," growled Ed, "Why is there so dang much time spent on Monday morning gabbing over the doings of the weekend?"

"When would such a discussion take place — Saturday morning?" laughed Al. "You feeling all right, Ed "

" 'Course I'm feeling all right. You don't need to be so sarcastic."

"Nerves!" frowned Al, "Too much weekend — tsk, tsk, tsk!"

"I'm not talking about myself, Al, but about the men in the shop. Just you notice the difference in activity Monday morning compared to any other morning. Ye bods, man, it's raising the devil at the Trocadero Bar with one, doing 75 along Beeline turnpike with another, getting the cold shoulder from his wife because he came home late with the third. Maybe you think the company don't suffer from those week-end rehashes!"

"What are we doing right now, Ed?" laughed Al, "turning out iron nickels for the stockholders?"

"I'm serious, really I am," reasoned Ed. "We've got to do something drastic; this can't go on every week."

"Don't press me too hard, Ed. Some years ago — when the boys used to lap up quite a bit of lager on their weekends," drawled El, "I worked for the old Dutch Fit Brewing Machine Co. in the Windy City. There was the outfit that practiced some pretty sound psychology."

"What the Hell are you driving at, man; have you got a hangover, too " said Ed. "Here I come to you, thinking possibly you might be able to contribute something of value to fix up a nuisance, and you ramble on about what a time you had in some brainy outfit around the stockyards."

"Now, Old Timer, just you hold your horses. I've got an idea that might be of service to you."

"Well, never mind the short story — get down to brass tacks."

"This outfit had what they called a "Big Head" morning; they had their men come to work an hour later on Mondays — and Boy, it worked."

"The way those fellows hanker after the dollars these days I'm afraid they would raise Cain if they had to lose an hour," replied Ed. "I grant you that they would appreciate the extra time in the hay, but I don't think they would stand for the loss of time — that is, pay time."

"Well, who's standing the loss of time now?" came back Al. "Why don't you take it up with the boys and see what they think about the idea; you can't tell, Ed, they may jump at it."

"Yeah!" retorted the other. "And no doubt down my throat."

"I think they'll like it."

"I don't," concluded Ed; "we'll see how they feel about it."

ARE THE WEEKEND REHASHES DETRIMENTAL, or do they help morale by building understanding and comradeliness? Are they inevitable, or is Al's hour of grace a sensible solution? Aren't some "bull" sessions essential to ease tension.. Your ideas or opinions will interest others. Their ideas on earlier subjects appear on later pages.

How to Get the Most Out of Punch Presses . . . V

Die Design

Minimum part cost comes only with efficient dies; the best way to assure efficient dies is to develop standard proven design details

BY E. H. GIRARDOT

PUNCHING, TOOL, AND DIE DIVISION, GENERAL ELECTRIC CO.

In the basic operations of piercing and blanking, two types of dies, progressive and compound, are utilized. Each have their advantages and limitations as discussed in Part IV of this series, so careful consideration must be given to select the type that will insure the lowest part cost.

Once proper selection of die type has been made, the final economy will still be affected by the cost and efficiency of the dies. Die cost, high maintenance and operating costs may join with the loss of production in seriously affecting ultimate part cost. The most effective method of controlling these troubles is through standardization of design details.

At the present time, die design is largely a matter of opinion and preference, dictated by each person's actual experience in the field. Individual experiences and backgrounds vary, however, with a resultant wide difference of opinion and practice relative to design details.

It is not intended to attempt to establish design standards, although various details which have proven effective in use and have contributed toward economical operation will be outlined. It should be emphasized, however, that some alternate details may prove just as economical, if not more so. The particular detail in itself is not as important, assuming that it is reasonably trouble-free in operation, as in the continued use of the same detail in all designs of similar nature.

Although it is strongly recommended that proven design principles be followed, every designer should be constantly on the lookout for a better or more effective method. When found, the new method should be carefully proven before acceptance as a standard design principle.

Permanent and complete press-tool assemblies built for the purpose of performing definite operations on specific parts—Type A dies, in other words—are the chief category for consideration along these lines. Other die types, such as those wherein only a punch and die assembly is built and mounted in a universal dieset for producing a limited number of punchings are excluded. Many of the design details of Type A dies, however, are also applicable to the other types.

Economy dictates that die cost must be in proportion to the total quantity of punchings to be produced. For this reason, Type A dies are divided into classes, each class related to the anticipated production requirements. Thus Class A, B, and C dies refer specifically to dies for high, medium, and low production, respectively.

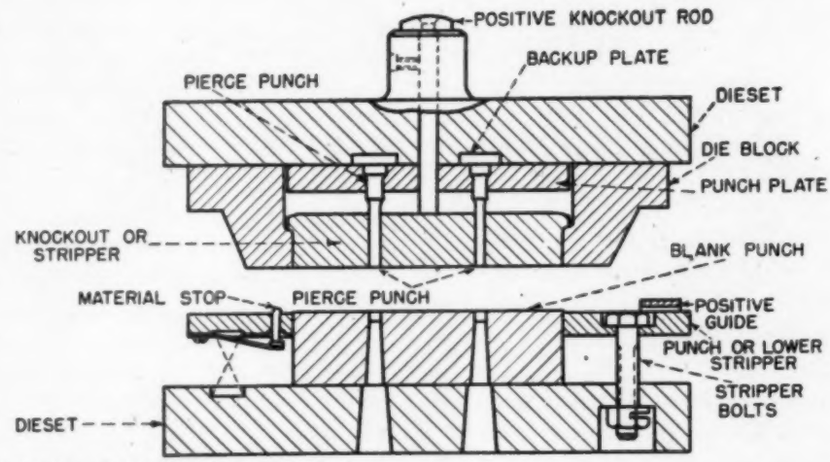


Fig. 32—COMPOUND DIE

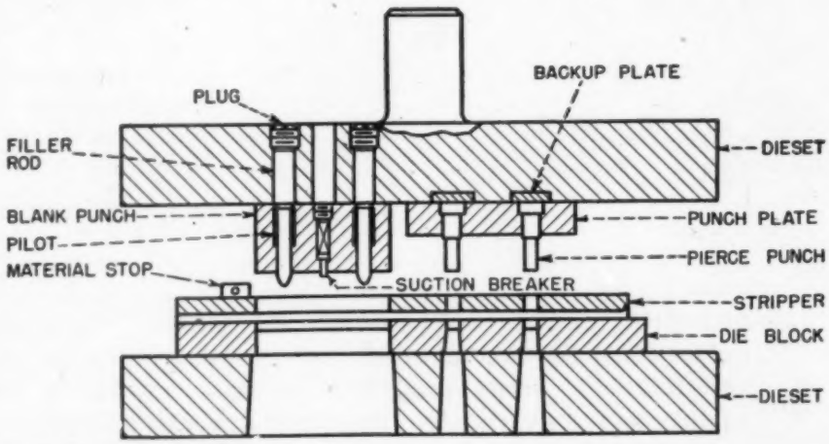


Fig. 33—PROGRESSIVE DIE

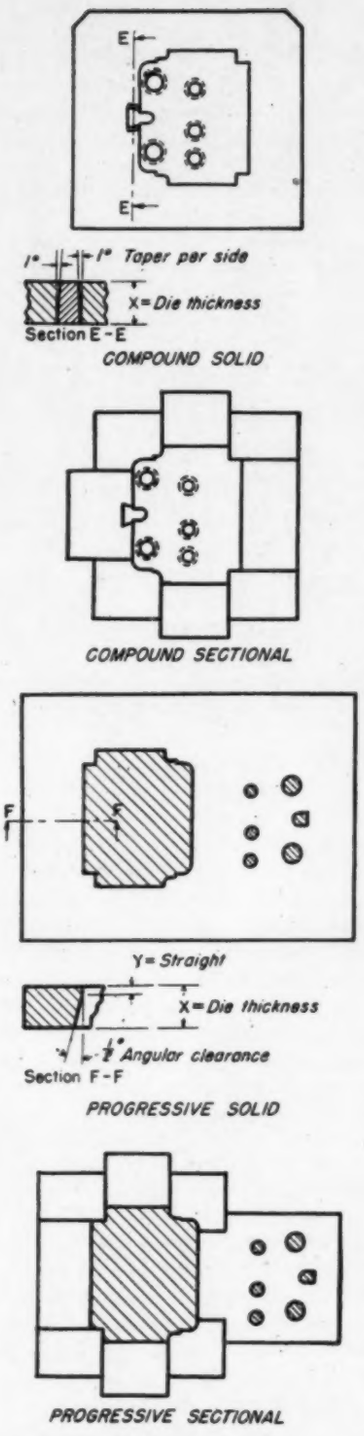


Fig. 34—DIE BLOCKS

Class A dies represent the best tool it is possible to build, regardless of cost, while the other classes represent cheaper tools capable of producing the smaller quantities involved. The main difference in Class B and C dies is that cheaper and lighter materials may be used, and that less consideration is given to the problem of ease in maintenance, than in Class A dies.

Overall economy is best achieved when a definite planning and design procedure is followed. With such a system the total quantity of pieces required can be considered, together with the desired rate of production, and the die designer supplied with the necessary information for his guidance such as the size and type of press; type of die (compound or progressive); class of die (high, medium, or low production); stock to be used (strip or coil); hand or mechanical feed; whether stacking is desired; and, in certain cases, availability of material layouts, particularly if the layout may affect the factors listed.

With decisions on these questions for guidance, the most appropriate tool for the job at hand can be laid out. Being closer to the actual detail, the designer is in an excellent position to cross-check all information and preliminary decisions, thus insuring the best possible tool.

Typical compound and progressive dies are shown in Fig. 32 and 33. Alternate design details will be described. In practice, the particular detail most suited to the job at hand is used.

Dieset

Standard lines of diesets are available which answer general needs. Produced in quantity and available on short delivery, they offer definite advantages to their users. The four-post sets are particularly recommended for high-production runs and for cutting thin materials, since they offer maximum guiding. Special care should be exercised with all die sets to provide proper lubrication of the guide posts and bushings .Inadequate lubrication can result in excessive wear and scoring of the posts or bushings, with inaccurate guiding.

Die Block

Die blocks, Fig. 34, both on compound and on progressive dies, are made either sectional or solid, to suit the particular part, sectional dies are strongly recomended for cutting thin materials and for high-production dies, because they can be fully ground and fitted closely to the punch. When used for cutting aluminum or mica, all joints should be carefully lapped and fitted together to prevent minute particles of the material from entering the joints and wedging the sections apart.

In general, sectional dies lend themselves more readily to blanks having square corners. In the event of radius corners, the split is most readily made at the edges of the radius. Another advantage of sectional dies is that inserts can more readily be fitted to accommodate intricate or delicate parts. They are, however, more expensive and should only be used when the size and the nature of the blank or the anticipated savings in die maintenance will warrant.

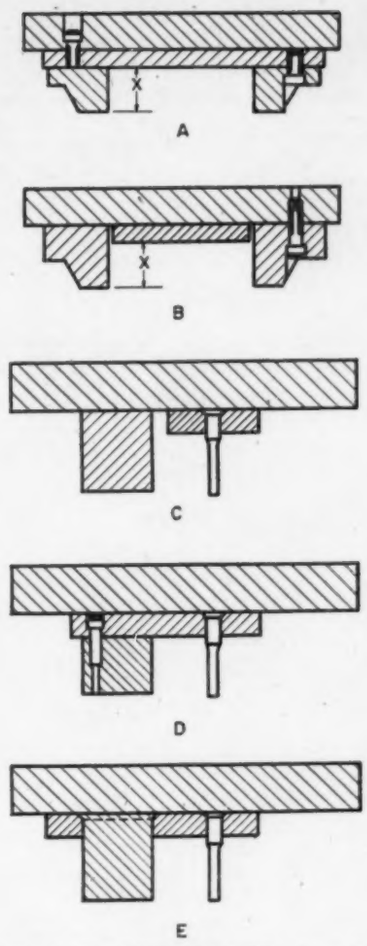


Fig. 35—PUNCH PLATES. A and **B** are for compound dies; **C, D,** and **E** are for progressive dies

Inserts, such as shown at Section EE, are held securely in place by a taper of 1 degree per side from the rear of the die. They are thus readily fitted and can always be tightly assembled in the taper slot. Compound die blocks are not provided with angular clearance.

Section FF shows straight portion Y in the top of the die cavity. This portion, called "straight," is generally made a minimum of 1-8 in. for cutting materials under 1-8 in. in thickness, and equal to the material thickness for heavier materials. It serves the double purpose of helping to keep the blank or slug in the die, and providing longer die life before the physical size of the die cavity is increased through grinding down into

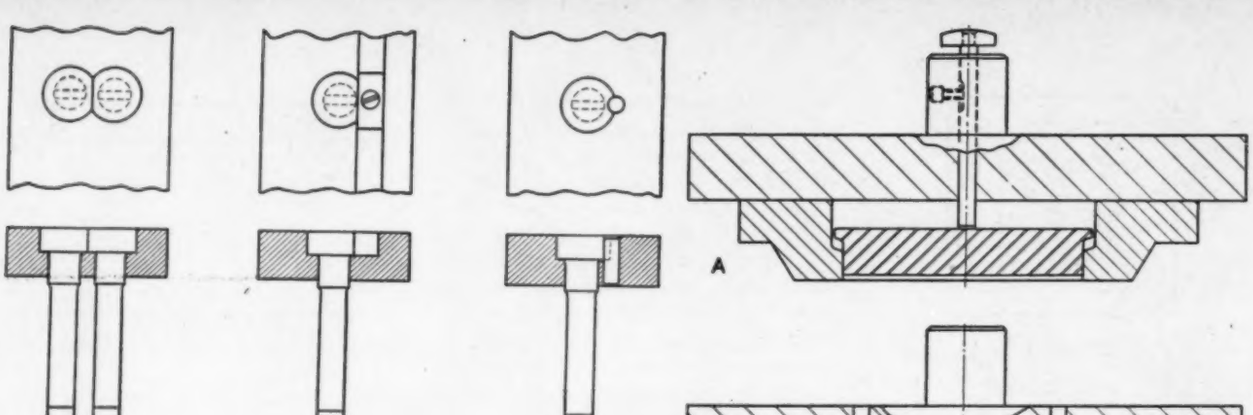


Fig. 36—Methods of locking punches in punch plates.

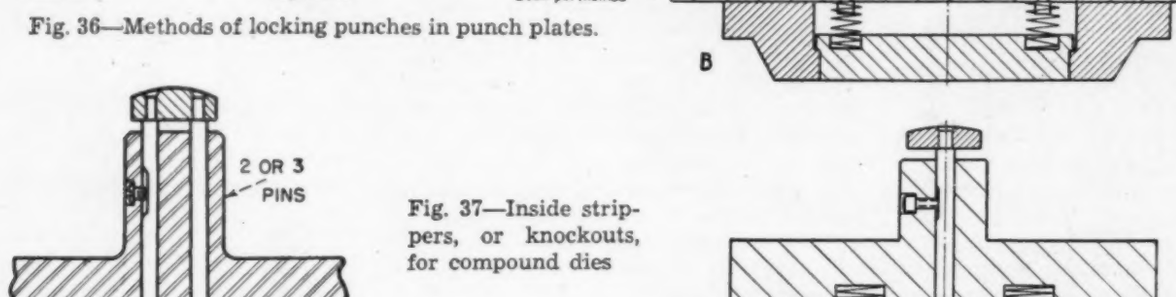


Fig. 37—Inside strippers, or knockouts, for compound dies

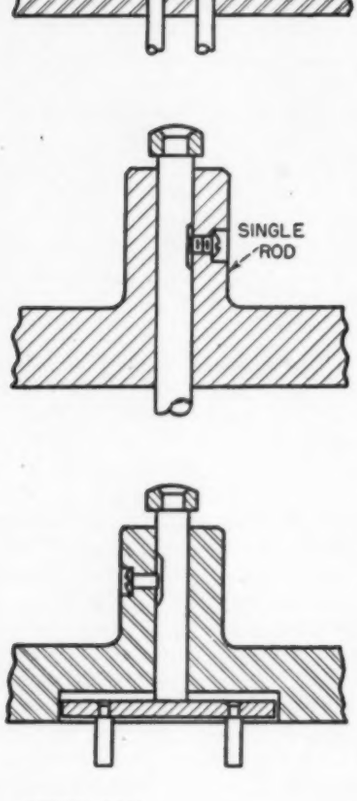


Fig. 38—Type of positive knockout rods which can be used with inside strippers.

the angular clearance. An angle of ½ degree per side is ample clearance to facilitate passage of the blank or slug through the die. Die clearance should be about 5 to 6 per cent of the material thickness per side to insure to clean cut blank.

Definite advantages can be derived through standardization of die-block thickness, both on compound and progressive dies. Finished thickness of 1⅜ in., 1⅛ in. and ⅞ in. appears most suited to Class A, B, and C dies, respectively. In this manner, the majority of dies can be built from a stock of only three thicknesses of tool steel.

Blanking Punch

Blanking punches on compound dies contain the cavities for the holes pierced in the blank. These cavities are provided with the same straight and angular die clearance as are die blocks for progressive dies. Punches may be made either sectional or solid, depending on their shape. In the event of delicate or intricate punches, it is generally advisable to consider sectional construction. Progressive dies utilize pilots and suction breakers in the blanking punches.

Punch Plates

When practical, punch plates are made of a thickness equal to, or slightly greater than, the press fit diameter of the largest pierce punches they are to contain, except that a minimum thickness of 5-8 in. is advisable. Fig. 35 A and B shows plates common on compound dies. That shown at A offers two advantages: First, die sections are more readily assembled in relation to the pierce punches because a smaller assembly is handled. Second, tool steel is saved because the same die life, X, is secured with a thinner tool-steel section. Three types of plates common in progressive dies are shown at C, D, and E.

When pierce punches other than round are required, they should always be locked in the punch plate to prevent turning. The three most common methods of locking punches are shown in Fig. 36. The method at A is only utilized when the distance between the punches is small enough to take advantage of flats on adjacent punch heads.

Knockout, or Inside Stripper

The removal of the blank from the compound die cavity is effected by means of a positive knockout plate, or inside stripper. A force of roughly 10 percent of the blanking pressure is required to remove the blank. Fig. 37 shows three types of inside strippers used in compound dies.

The positive knockout, as at A,

removes the blank at the top of the stroke by means of the press knockout attachment. The spring type, B, utilizes sufficient spring pressure to leave the blank on the lower punch as the die opens. It is particularly advantageous when the blank area greatly exceeds the effective press knockout area.

The combination spring and positive type, C, holds thin or springy materials flat to the punch prior to cutting. Enough spring pressure is provided to flatten the material, yet not enough to strip it from the cavity without the aid of the positive knockout. Springs are either pocketed or piloted to insure efficiency in operation and to prevent them from shifting and breaking.

Knockout Rod

Considerable force must be exerted by the positive knockout rod to remove the blank from the die. It must be sturdy enough to withstand this force. Fig. 38 shows various types of positive knockouts.

Part VI, including additional details of die design, will appear in an early issue.

Printing Replaces Hand Filling Of Embossed Surfaces

Costly hand application of enamel to embossed work is now avoided by molded synthetic-rubber die

By H. O. BATES
PRESIDENT, ACROMARK CO.

PRODUCTION of Electrolux domestic vacuum cleaners and air purifiers today is more than three times that of the best prewar years, yet factory floor space has been increased only a little over 50% in the meantime.

While a large part of the increased production capacity is due to the installation of more productive machines and tools and to work-station rearrangements, a great precentage of the increase must be credited to the ingenious materials-handling conveyors developed by Electrolux methods and plant layout engineers.

This relatively small plant has now installed more than ¾ mi. of gravity roller conveyors, ½ mi. of overhead monorail chain conveyors and 1/5 mi. of carrousel and belt conveyors. Each conveyor is designed for a particular handling job.

The waste of enamel, and the resultant mess, as well as the development of a proper enamel for an attractive glossy finish, a successful method of wiping, and contour difficulties in the case of contoured or oddly shaped parts have all been discouraging factors which have frequently increased the cost of the operation out of all proportion to its value.

A solution to these difficulties has now been developed in the form of a printing method, using a perfectly molded synthetic rubber die of sharp and well-defined detail with a slightly smaller face than the required design to allow for bleed of the enamel. Designated the Acro-Printer, a machine for this purpose incorporates a means of providing the die with positive movement, and holding the workpiece in exact relationship in respect to the lettering or design.

The filling of convex or otherwise contoured parts presents considerable difficulty, and in making the filling dies for this type of work it was necessary to produce a mold from the part itself. This mold, which represents the filling die, was then reduced in face to allow for bleed when the enamel was applied. After refinement, this die was used as a master to engrave a reverse mold for use in casting the actual working die. This was cast in semi-hard synthetic rubber to avoid spreading or distorting beyond the allowable limits when applying the enamel under pressure.

To apply the enamel to the die presented another problem which was solved by using an inking platen of the same contour as the part being filled. This in turn was coated with enamel by a synthetic rubber roller shaped like a spool but having the same contour as the platen. By tying in the back and forth movement of the coating roll with the die holder, guided at each side by channeled side plates, enamel distribution was accomplished.

Hand-operated printer with suitable locating fixture for filling embossed hub caps with enamel

In operation, a backward movement of the operating handle places fresh enamel on the die, and a forward movement impresses the die squarely down on the surface of the work, thereby accomplishing the filling.

Work-holding fixtures are, of course, highly important, and must be designed to bring the work into exact relationship with the die on every stroke.

Originally designed for filling hub caps, the machine can be adapted to filling flat surfaces such as nameplates, signs, and ornaments in wood, plastic, metal, glass and ceramics.

Heat-Treating Principles and Their Application to Salt Baths--II

Control and operation of salt baths depend on the temperature range and nature of the salts used. Suggestions are based on a broad consulting experience

BY HAIG SOLAKIAN, Sc.D.

With few exceptions, all metals, before reaching the state of a finished product, undergo a certain degree of heat-treating during processing and fabrication. Such heat-treating may involve annealing, stress relieving. hardening, aging and tempering. The temperature range covered by these operations is from 300-2350 F. The lower portion of this range is reasonably safe for most metals.

Very little surface attack and oxidation take place when metals are heated in an ordinary atmosphere within 300-1000 F. But when the required temperature is above 1000 F., oxidation starts and proceeds at an accelerated rate as the temperature is increased. Other difficulties are encountered when steels are heated to annealing or hardening temperatures in an oven furnace. These are decarburizing or loss of carbon from the surface of the steel, pitting, grain growth, distortion and cracking.

Salt baths offer a reasonable solution to these difficulties. The molten salt bath excludes oxygen, carbon dioxide and moisture, and thus protects the metal from their harmful effects at elevated temperatures.

Salt baths may be classified as neutral and carburizing. Here only the neutral ones will be considered:

1. Low-temperature salt baths
2. Medium-temperature salt baths
3. High-temperature salt baths

Low-Temperature Salt Baths

These baths—known as tempering or drawing salts—are used for any operation requiring temperatures of 300-1150 F. For the most part they contain varying percentages of sodium nitrate, potassium nitrate, sodium nitrite and lithium nitrate. These combinations begin to decompose noticeably above 1100 F., and are not recommended for use above that temperature to avoid attack upon pot and work.

Such baths are used for the tempering of plain carbon and high-speed steels, stress relieving and annealing of copper and brass, solution and aging treatment of aluminum alloys, and blue-black coloring of steel. They are ideal as a quenching medium for the austempering and marquenching operations described in the previous installment.

With these nitrate baths, certain precautions must be observed. In particular, cyanide compounds must not be permitted to come in contact with them. For example, a basket or fixture used in a sodium-cyanide bath must be washed clean before introduction in the tempering baths, and vice versa. With this simple precaution there is no hazard involved in their use.

Medium-Temperature Salt Baths

These baths are used within a temperature range of 1050-1650 F., and are practically limited to varying mixtures of sodium chloride, potassium chloride, calcium chloride, barium chloride, strontium chloride and lithium chloride. With the exception of a combination containing a fairly high percentage of lithium chloride, all of these baths have a melting point not under 950 F., and few can be used below 1250 F.

One defect common to most of these salts is their tendency to decarburize after they have been in operation for several days at a temperature close to the upper range. Where heat-treated parts are subjected to further finishing operations, a slight degree of decarburization is not a serious matter.

Some effort has been made to control or prevent decarburization in these baths by the addition of a small percentage of sodium cyanide or borax. The cyanide removes the bath from the neutral category, since it will carburize and thus add carbon and nitrogen to the surface of the steel. Besides, the small quantity of sodium cyanide readily oxidizes to sodium carbonate, which is an effective decarburizing agent. Therefore, supposedly neutral baths bearing cyanide start with carburizing and finally end with decarburizing—thereby becoming a serious handicap.

Borax is little better than cyanide. Mostly it forms a metaborate with the decomposed salts and settles as a sludge. It offers, however, one definite service—to carry down metallic exides, especially of iron, thus freeing the bath of floating or suspended harmful iron oxide.

Medium-temperature baths are used for numerous applications such

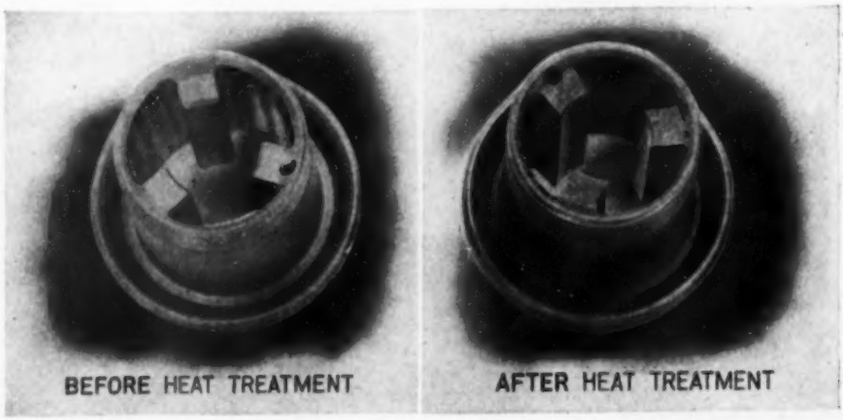


Fig. 4—Modern salt baths are compounded to achieve clean hardening, as these before and after examples show

as annealing of brass and steels, hardening of water or oil quenching steels (Fig. 4), silver brazing of ferrous and non-ferrous metals and finally for the high-temperature heating of parts in austempering or marquenching operations.

High-Temperature Salt Baths

These baths cover the temperature range 1750-2350 F. and are used for the annealing and hardening of stainless steels, copper brazing, heat-treating of air-hardening and high-speed steels.

Some of the chemicals available for these high-temperature baths are barium chloride, potassium chloride, barium fluoride, calcium fluoride, chromium fluoride, a mixture of borax and boric acid, a synthetic sodium-calcium silicate and silica.

Barium chloride alone has been used for many years, here and abroad, but it has not proved entirely satisfactory because of excessive fuming and decarburizing above 1900 F.

The borax-boric acid combination, although in use here and there for nearly 25 years, likewise has the distinct disadvantage of attacking steel and causing size loss of tools. This size loss arises from high affinity of the bath for iron, the bath having power to absorb more than 40 per cent of its weight of iron. At these high temperatures, the problems multiply and it seems that the chemical reactions proceed at an accelerated rate. The salts react with the pot and also with the tools being treated.

These difficulties do not stop here. The dissolved iron is oxidized to iron oxide, which reacts with carbides in high-speed steel, to produce a soft, decarburized skin on tools.

Aside from the harmful effects mentioned above, gradual absorption of iron by the bath introduces another problem. In the electrode-type, high-speed furnace, proper resistance of the bath is necessary to reach the desired temperature. If the bath rapidly absorbs iron, its electrical resistance drops and likewise its heating efficiency.

In hardening high-speed steels, one must deal with at least three different salt baths instead of one. These usually consist of: (1) a preheat bath, (2) a high-temperature bath, (3) a quenching bath. These baths must supplement each other physically and chemically. The usual arrangement is shown in Fig. 5.

The preheat bath is ordinarily used from 1450-1550 F. At this temperature range, the salt should be stable and liquid so that it will drain from tools almost like water. Under these conditions, little salt will be carried over to contaminate the high-temperature bath.

The high-temperature bath is undoubtedly the most important one in the combination. It must be stable at high temperature, and liquid enough to drain readily from the work as it is carried to the quenching bath. The salts must be reasonably water soluble, to wash easily in hot water. And, most important of all, the bath must be neutral to high-speed steel; that is, it should neither carburize nor decarburize the tools.

The quench bath, which usually operates between 950-1250 F., has two functions: (1) to wash off the high-temperature salts, and (2) to cool the tool to a temperature from which the tool may safely be cooled in air or quenched in oil.

Without a full understanding of their limitations and control, salt baths will fail to function properly and lead to trouble. Practically all the neutral hardening salt baths are, or should be, neutral when put in service.

Within its operating temperature range, any salt bath is reasonably stable and does not decompose rapidly. But there is always a slow breakdown, the rate increasing with temperature. If breakdown products are allowed to accumulate, the physical and chemical characteristics of the bath are markedly changed.

A method devised by the author, and extensively used, enables checking such baths and quickly determining their degree of neutrality. A gram sample is dissolved in 100 c. c. of distilled water, then heated gently to a boil for about 5 min. The solution is filtered and the filtrate is titrated with 0.1 normal hydrochloric acid to a pink end point, using methyl red as an indicator. For satisfactory performance any neltral bath should require no more than 2 cc. of 0.1 normal hydrochloric acid, in accordance with the above titration. Several types of high-speed tools hardened in a bath checking at 2 c. c. alkalinity, are shown in Fig. 6.

The control of tempering baths, consisting of nitrates and nitrites, is relatively easy. These baths should not be used above 1100 F. If the temperature is allowed to go beyond 1200 F., their attack on metals becomes almost violent. Under such circumstances a steel pot 3/8 in. thick has been eaten through in less than 30 min. A failure of this type causes loss of salt and pot.

If the operating temperature is around 1050 F., as in tempering high-speed steels, an alloy pot is preferred. Longer pot life and a cleaner, oxide-free bath more than offset the higher cost of an alloy pot.

If the bath is operated at a low temperature, below 900 F., a welded or pressed-steel pot is satisfactory.

In fuel-fired furnaces, starting from cold, the burners should not be used full blast. Salt baths, in general, are poor heat conductors when solid. Hence, the fire should be gentle in starting from cold and kept so until the salt melts and is able to absorb and conduct away the heat. Otherwise, the pot wall may be overheated, causing excessive scaling and premature failure.

In case a bath is operating near the upper limit, such as 1100 F., and there is evidence of breakdown, it

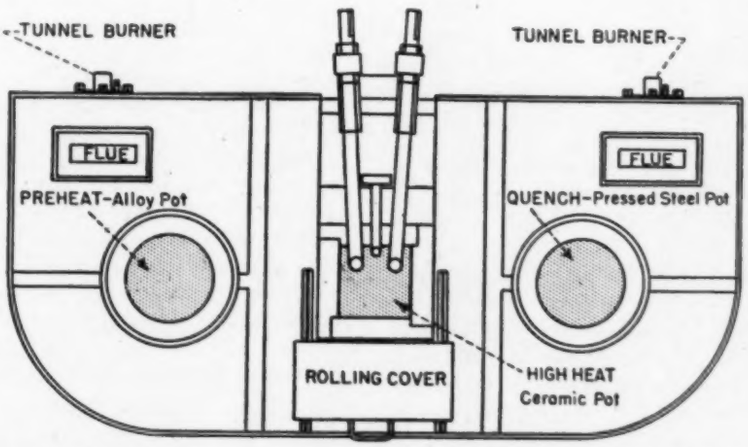


Fig. 5—To form a convenient unit for heat-treating high-speed steel, three pots—preheat, high heat and quench—may be assembled in one shell

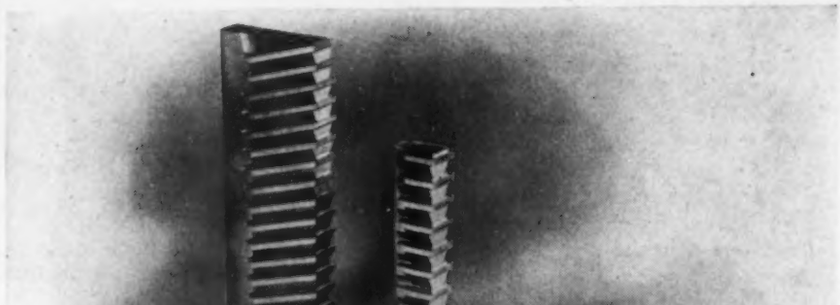


Fig. 6—Clean hardening of high-speed steel tools with little or no distortion can be accomplished in salt baths

may be rectified by adding about 0.5 per cent sodium acid sulphate or sodium dichromate. The proper amount may be determined by a simple neutrality test. A one gram sample of the salt should not require more than 2.0 c. c. of 0.1 normal hydrochloric acid to neutralize it. If more than 2.0 c. c. is required, a little more of the sodium acid sulphate may be added.

Control of medium-temperature salt baths is somewhat more difficult. The normal temperature range is 1250-1650 F. For safe operation they should be limited to 1650 F. maximum. Of course, they may be operated above 1650 F., if the parts to be treated are not too closely finished and minor surface defects such as scaling, pitting and decarburizing, may not be serious or objectionable.

Above 1650 F., medium-temperature baths fume excessively, depositing powder all around the furnace. If no hoods are utilized, such powders will settle on other equipment, absorb moisture and promote rapid corrosion.

In starting from cold in a fuel-fired furnace, medium-temperature baths must be heated slowly. They do not melt below 1000 F., and fast firing will ruin the pot. An alloy pot should be used, or even better, a ceramic pot heated by immersed electrodes. In the latter case, contamination with metals is almost eliminated.

When oily parts are washed in alkaline solutions prior to heat-treatment, they should be rinsed in hot water to avoid contaminating the bath and raising its alkalinity.

Although medium - temperature baths are reasonably stable within their operating range of 1250-1650 F., they will not remain neutral indefinitely. If the bath is operating at around 1650 F., or over-heated beyond this temperature, the chlorides ultimately oxidize to carbonates which cause decarburization. And then the bath must be rectified with cheminals that have acid reactions to neutralize the carbonates.

Control of High-Temperature Salt Baths

At present, barium chloride is the most commonly used base chemical for high-temperature salt baths operating from 1750-2350 F. Of course, varying percentages of other chlorides and fluorides are used in the bath.

Because of the high temperatures involved, these baths are quite critical and require rigid control. They fume rather heavily above 2100 F., and the chlorides slowly break down and finally oxidize into carbonates. Such conditions, if unchecked, mean definite risk to and possible spoilage of high-speed steel tools.

As mentioned earlier, the salt-bath hardening of high-speed steel requires a preheat, a high heat, and a quench bath. It is of paramount importance that the first two baths be kept neutral. The quenching bath usually is alkaline, and may contain 10-20 per cent sodium cyanide. Therefore, the quench salts should never be carried over to contaminate the previous two baths. Any hook, basket or fixture carried over into the quenching bath should be washed clean before its reuse in the preheat and high-heat bath.

In some plants, fixtures and baskets, as soon as they are removed from the quench and the high-speed tools taken off, are quenched into clean hot water. Water quenching of fixtures, while they are still hot, shatters and breaks loose any adhering salt. Quite often such fixtures are sandblasted after each use to be sure that no quenching salt is carried back to the preheat and from there into the high-heat bath.

With rare exceptions, most high-temperature baths operate in a ceramic pot. The pots are heated by immersed electrodes. In such a furnace, the portion of the salt coming in contact with the electrodes is heated to a temperature above that of the rest of the bath. Even without over-heating, a bath operating at around 2300 F. will decompose slowly. With overheating at the surface of the electrodes, the breakdown of salts is accelerated. Byproducts are alkaline and severely attack the pot and the high-speed steel. If byproducts are allowed to accumulate in the bath beyond 2½ per cent, corresponding to 3½ c. c. alkalinity, it is impossible to harden high-speed steel tools without pitting and heavy decarburization.

Therefore, to insure safe hardening of high-speed steels, it is imperative that the decomposition products in high-temperature baths be neutralized continuously, to maintain the salts at a nearly perfect neutral condition. The situation is further complicated by the presence of metallic oxides introduced in the bath from hooks, fixtures, baskets, electrodes and finally from the tools processed. These metallic oxides react with the surface of the tools and cause decarburization. In this respect they are more troublesome than the decomposition byproducts, since the latter react with the rectifiers and are neutralized, while the metallic oxides do not.

An effective method for eliminating metallic oxides is to allow the bath to quiet down for about 15 min. at the end of the day's work. During this period the heavy metallics settle to the bottom. Then, with a suitable ladle the sludge at the bottom of the pot, containing heavy oxides, can be removed and discarded. On the other hand, the decomposition products can be fully neutralized and rendered harmless by the use of chemicals acting as acid radicals.

The object of any control is to achieve the end product with minimum difficulty and spoilage. In this connection, some of the factors that may cause trouble can be enumerated:

Potential Sources of Trouble

1. In the heat-treating of tool steels, particularly high-speed steels, two factors of great significance are: (a) hardening temperature, (b) time

at heat; that is, the period for which parts are soaked.

2. To do a good heat-treating job, the hardening temperature must be correct for each type of steel. If it is too low, the tool is under-hardened and may not function properly. If the temperature is too high, the tool will be overheated, with the resultant hazards of grain growth, brittleness, distortion, short tool life and possible cracking.

3. The time factor is the most important and probably the least appreciated one. In heating the tool to the proper hardening temperature, certain internal changes take place in the steel. A definite time period is necessary to bring about such a change. This time period depends upon the size or mass of metal involved. If insufficient time is given, the necessary microstructural change is not completed, and the benefits of heat-treating are not fully realized. Under such conditions the tool usually is too soft and may not be suited for the purpose intended. If too much time is allowed, there is danger of decarburization, grain growth, excessive size change and cracking. Use the shart, Fig. 7, as a guide. Note that one curve is for timing in medium-temperature hardening, and the other for timing when hardening high-speed steel tools.

In timing any tool or die, only the minimum dimension is considered. For example, in a die measuring 1½x 4x6 in., only the thickness is significant and taken into account. It is immaterial if the other dimensions on a similar piece are 4x6 in. or 8x12 in. In the case of round pieces, the minimum dimension is important. If the thickness is less than the diameter, then the thickness is the minimum dimension and determines the timing. In cases where the diameter is the minimum dimension, the timing is based upon the diameter. Hence, two tools with the same diameter but of different length receive the same time. One might speculate upon the properties of an ideal neutral salt bath; but it has not yet been formulated:

1. Always neutral, no matter how long in use, to the pot and tools
2. Completely water soluble and easily washed off
3. Wide temperature range, 100-2300 F.
4. Low viscosity and low drag-out
5. Non-sludging
6. Non-fuming
7. Non-hygroscopic

In the next and concluding article of the series, suitable salt-bath furnace equipment will be discussed.

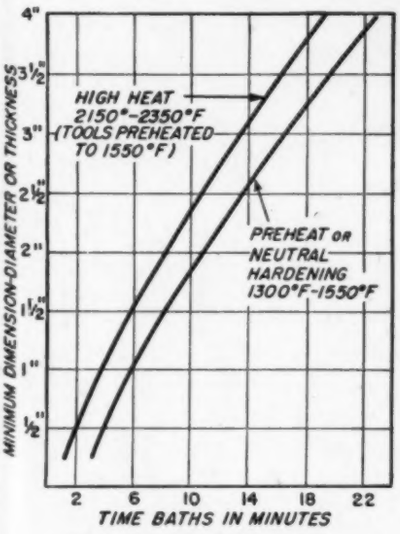
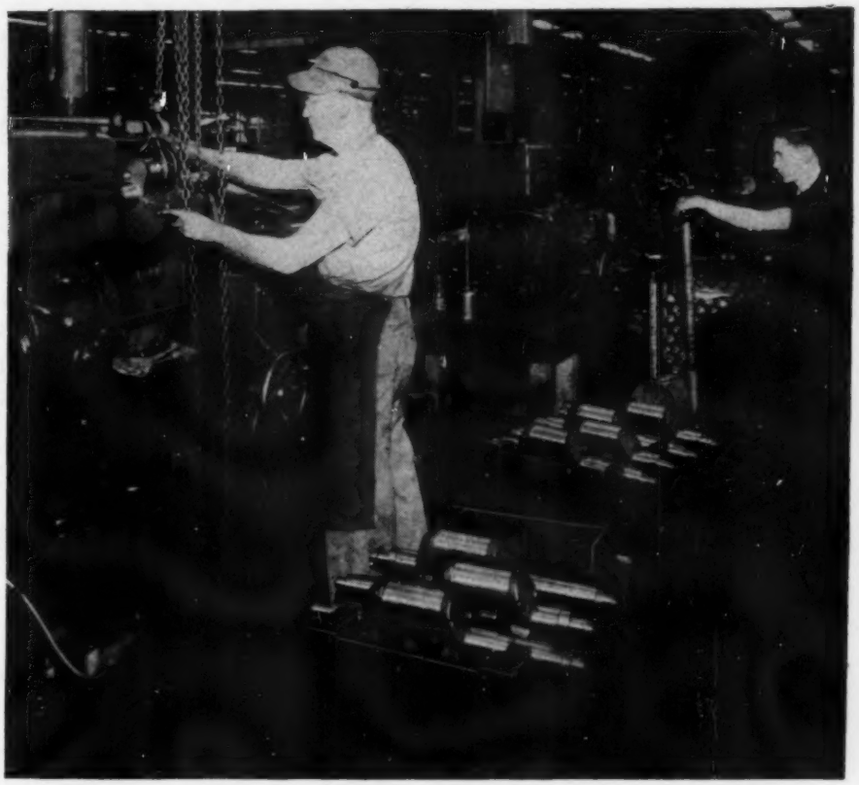


Fig. 7—Timing of tools in the preheat and high-heat baths is of prime importance. These curves will serve as a guide, but note that the **minimum** dimension of the piece must be used

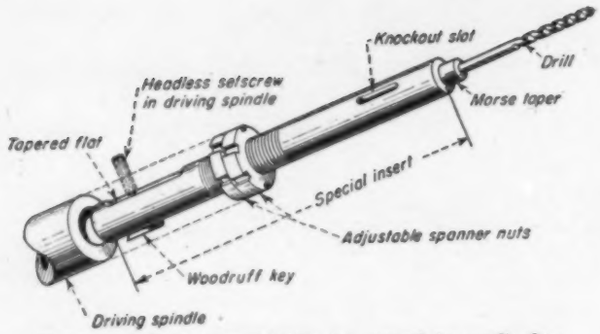


NOTCHED BINS HANDLE CRANKSHAFT

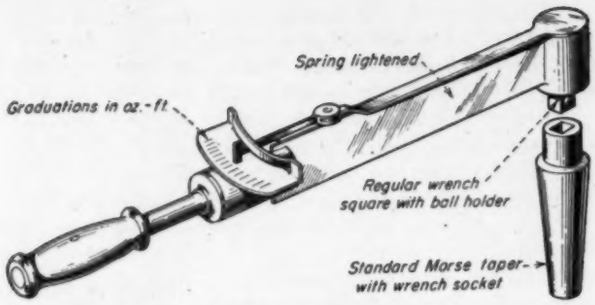
A solution applied by a methods engineer to a materials-handling problem involving crankshafts might well be applied in handling of other odd-shaped machine parts. Notches cut in the sides of deep skid bins hold four crankshafts and prevent them from rolling and striking one another when hand-trucked between machines. Bin depth and the offset projecting corner-reinforcement angles make bin nesting possible to four or five high for more efficient use of temporary storage space.

Results of bin use were: number of damaged crankshafts reduced; materials moved more rapidly between operations; "float" at each machine was kept to a minimum. The operator works out of one bin. As he finishes the material in that bin, it is replaced with another bin of material to be processed.

This reduction of stored material at each machine means less capital invested in materials in process. Also, by having material brought to and from the machine operator, skilled labor is used entirely for production and not for shoving and manhandling shafts. Even machine loading and unloading is lightened by a handy work clamp and a monorail-mounted chain hoist.



Torque wrench is modified to record in oz-ft. for easy setting of torque controls on drilling heads of multiple-head machines



Quick change of drills for blind holes that must be held to accurate depth is simplified by presetting of drill in an intermediate insert fitting between drill spindle and drill

Drilling Kinks Cut Machine Downtime

Two ideas on multiple-drillhead machines not only reduce downtime of machines but also ease setup job and control of hole depth

BY CHESTER S. RICKER, DETROIT EDITOR

MULTIPLE integrated processing of parts in a single machine makes it vitally important to prevent tool breakage and so avoid shutting the whole machine down until another drill, reamer or tool can be substituted.

One large manufacturer who installed two of these progressive machines recently has developed two time-saving methods of handling the drills. The Avey drilling heads have torque controls on the drive. When a chip raises the torque beyond a certain point, the drill withdraws to clear the chip and again is fed into the hole.

It has been found necessary to find a simple "foolproof" way of setting the torque controls. A regular torque wrench, familiar to most mechanics, was modified for this purpose. The heavy flat spring, which ordinarily records torque in lb.-ft., is replaced with a thin one that measures the torque in oz.-ft. A Morse taper with a socket on one end replaces the drill, and the torque control is adjusted while proper torque is applied to the drive spindle.

All holes on this job are blind drilled so the depth of the hole must be accurately controlled. To save time in changing drills, each one is mounted in a special intermediate piece. This piece is held in the spindle with a headless set screw that bears against a taper flat which draws the insert down into the spindle as it is tightened. A Woodruff key takes the drive.

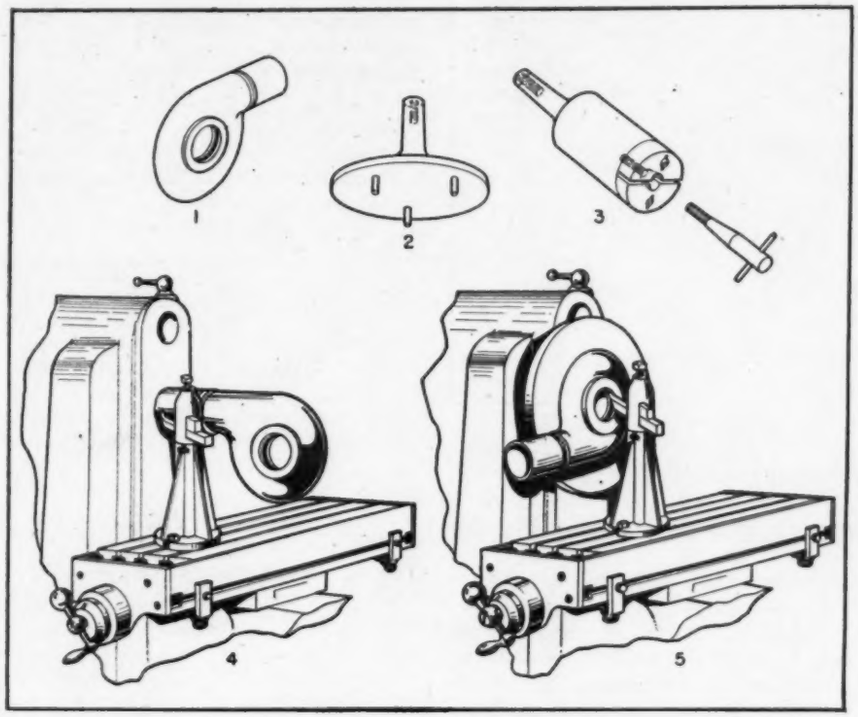
Adjustable spanner nuts on the insert allow accurate positioning of the insert against the end of the driving spindle. After a drill is sharpened, it is mounted in an insert which is dropped into a gage that measures the distance from the drill tip to the face of the outer, or left, spanner nut. When this has been adjusted correctly, the right nut locks it in place.

Thus, to change a drill takes only seconds because the holder and drill are removed together and an adjusted replacement unit is slipped in place. Only a setscrew need be loosened and tightened to accomplish the change.

There are 26 individual drills that operate simultaneously in this one machine. As the whole machine, if one drill fails, is down until a new drill can be inserted, use of preset drills is important to continued production.

I've been hearing rumors you were thinking of leaving

Practical Ideas



Milling Machine Handles Turning With Swing Too Large for Lathe

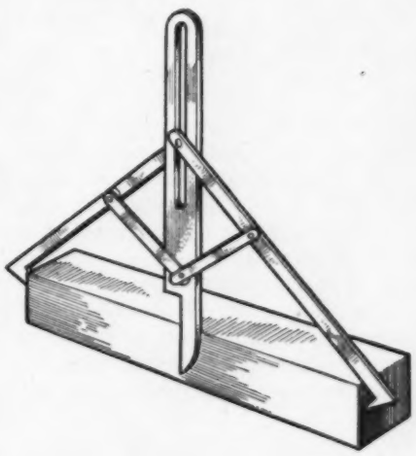
A recent job taken on by a small machine shop consisted of turning several surfaces on a large fan housing (Fig. 1). Although the job would have normally been performed on a lathe having at least a 28-in. swing, the shop had only a 9-in. lathe. The idea that allowed the shop to accept the job was a setup on a small milling machine.

A toolpost-extension base was cast from iron to elevate the standard lathe toolholder from the milling table to the spindle of the machine. This also allowed considerable clearance between the table and spindle —enough to swing the housing. The base, shown in Fig. 4 and 5, was made with four strengthening ribs and with a T-slot milled in the top to hold the toolpost. It was bolted to the table through two slots in its heavy base.

The outside diameter of the hub was turned first, although the setups could have been made in either order, by mounting the housing on a special fixture (Fig. 3) by its inside diameter. This was accomplished by securing the fixture to the spindle of the machine and expanding the fixture's collet against the hub's inner surface using a hand locking screw. The locking screw was turned partially into the fixture, the housing was mounted, and the screw was tightened by hand and removed through the large opening in the body of the housing. With the toolpost, base and tool in place, the O.D. of the hub was easily turned by using the crossfeed of the milling machine.

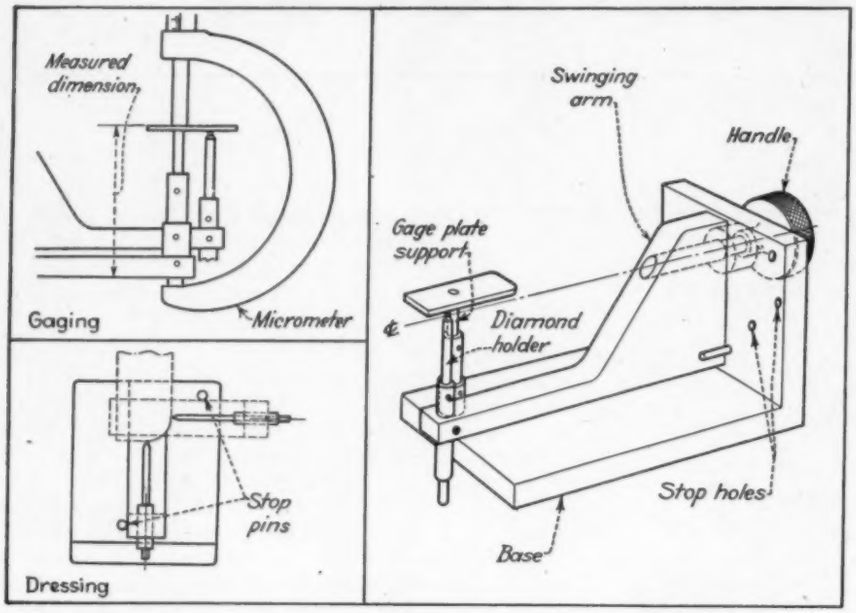
The setup for turning the flat surface at the large opening required a fixture (Fig. 2) made up of a steel shank that secured to the spindle of the machine and a cast-iron plate which held the housing by means of three studs. The studs went through holes in the housing and wing nuts were turned down by reaching through the opening. With this setup the flat surface was faced off and the I.D. of the large hole was finished.

The faceplate (Fig. 2) could be slotted to duplicate a common lathe faceplate if many similar jobs were to be done on the mill. In converting a mill to do many lathe jobs the table should be lowered as much as possible to allow the largest possible swing, since this large swing is the principal advantage of using the milling machine. In addition, an adjustable toolpost holder could be made to support the tool at any required height. *Frederick C. Lurz, Pelham, N. Y.*



Gage Finds Center of Bar Stock

A quick way to find the center of bar stock, pipe lengths and the like is to use a centering gage of the sort shown in the illustration. The components can be assembled using rivets or bolts and nuts, and then hand ground on a wheel grinder to the final accurate dimensions. Fairly tight joints should be used to avoid lost motion in the gage. *Hans Schmidbauer, Goggingen b. Augsburg, Germany.*



Fixture Regulates Wheel Dresser For Accurate Radius and Arc Cuts

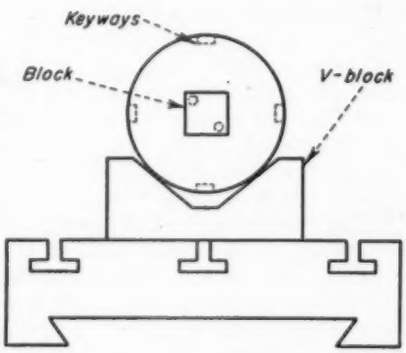
This dressing fixture for forming radii on grinding wheels has two unusual features — a device for setting the exact radius desired, and a system of stops which control the length of arc formed.

The action of the dresser, like many other dressers, is such that when the handle is turned the swinging arm rotates and causes the point of the dresser to describe an arc. This arc is either concave or convex, depending upon whether the point is above or below the centerline of the swinging arm.

The radius, the distance from the point to the centerline, is set using a gage plate and support which fits into a counterbored hole in the base of the fixture. Through a system of setscrew-held collars, this support can be adjusted to any practical length, which is set from a micrometer caliper.

The length set on the gage-plate support is found by adding, or subtracting, the required radius to a known constant, which is the distance from the bottom of the base plate to the centerline of the swinging arm, plus the thickness of the gage plate. After this dimension has been set on the gage-plate support, the plate is moved around and the diamond holder is adjusted to contact the bottom of the plate. The support is then removed and dressing can begin.

The stop holes in the vertical plate can be drilled in any position required by each dressing job. Detail at lower left shows their positions for dressing a convex radius with a 90° arc. Short dowel pins are inserted in the drilled holes to limit the motion of the swinging arm. *Allen B. Nixon, Springfield, Mass.*

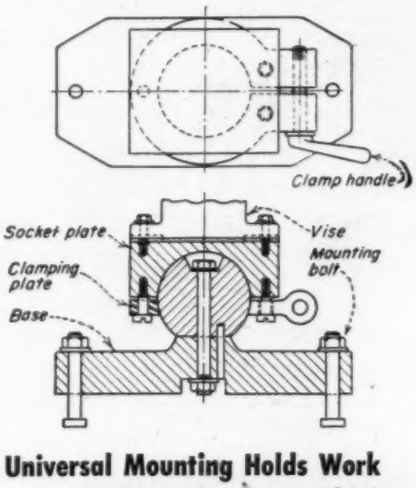


Positioning Block Locates Keyways

One problem we encountered recently was how to locate and cut four keyways which were to be equally spaced around the circumference of a piece of bar stock. Our solution was to mount a locating block on the end of the bar, from which we could locate the bar exactly.

A small block, not necessarily square, but with all sides at 90° to each other, was bolted to the stock with two screws. The screws held the block securely until after all keyways were cut. The work was mounted on a boring mill table and the flat sides of the block were indicated from the table surface.

By using this indicator and block setup we were able to locate the keyways within close tolerances without the use of an indexing head, which was not available. *J. J. Kocinski, Maple Heights, Ohio.*

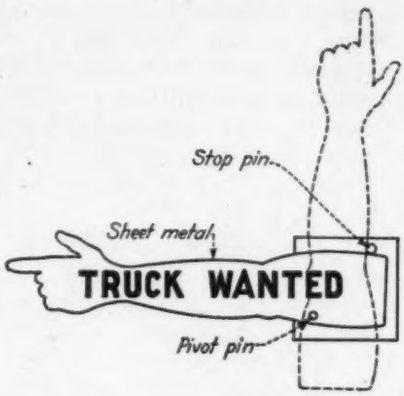


Universal Mounting Holds Work At Odd Angles for Machining

A type of universal mounting that is not difficult to make is shown in the accompanying illustration. Mounted on a milling machine, drillpress or other machine tool, it can be used to set work at a number of different angles.

The ball of the mount is faced off on the bottom to allow a firm and strong connection by a large bolt and a locating pin. The use of only two bolts to fasten the mount to a machine table allows it to be attached in a number of positions, depending on the spacing of the T-slots in the table. The quick-acting threaded clamp allows the mounting to be loosened easily and changed in position.

The clamping plate or ring is held in place by three capscrews. The holes drilled for the two screws near the clamping handle are oversize to allow the ring to be expanded when the joint is loosened. *F. Scriber, Providence, R. I.*



Adjustable Signs Call Truckers

We eliminated the time lost by foremen in going after truckers, and also stopped any excessive waiting for trucks, by installing a number of these signs on pillars at the ends of branch aisles. The signs are painted with black letters on yellow backgrounds, and are made of sheet metal.

Each sign pivots on one pin and is supported, in either an upright or horizontal position, by a stop pin. To call truckers, the foreman walks to the nearest sign, flips it horizontal, and truckers who patrol the main aisles are soon on hand. *Reed-Prentice Corp., Worcester, Mass.*

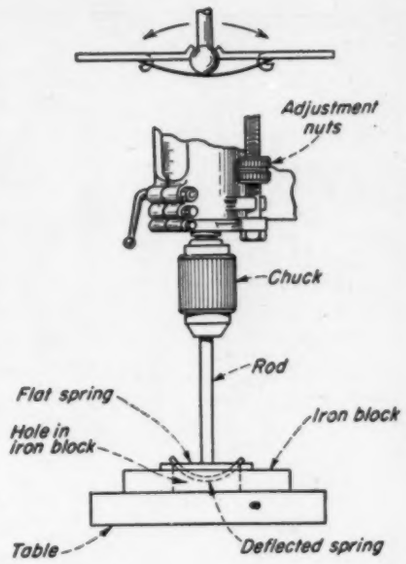
A small block is made; a hole to fit a surface gage spindle is drilled parallel to one surface, and a small setscrew hole is drilled and tapped. The block is used by assembling it to the gage spindle, as shown, and mounting a dial indicator above it. After the surface gage spindle is lined up absolutely vertical, a reading is taken with the gage on each side of the approximately-located cutter, with the block against each side of the shaft.

The cutter is centered by moving the shaft a distance of half the difference in gage readings in the direction of the smaller reading. *Chris Sorenson, Racine, Wis.*

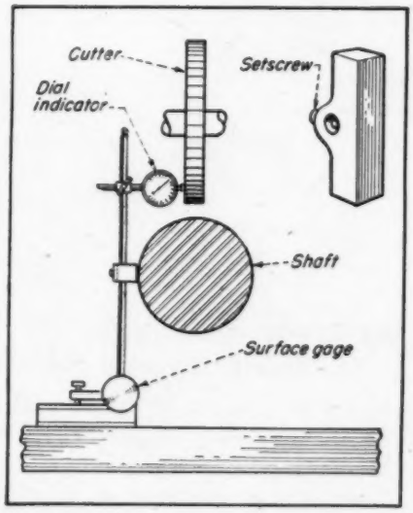
Fixture on Drill Tests Springs By Deflection Check of Samples

The lack of a spring testing machine in one shop caused the utilization of a small bench drill, with a simple fixture added, to check shipments of flat springs.

A rectangular hole was cut in a flat, iron block or plate to allow the spring to deflect as in the drawing. The depth adjusting nuts on the drill column were adjusted to allow a 3/16 deflection of the spring into the hole.

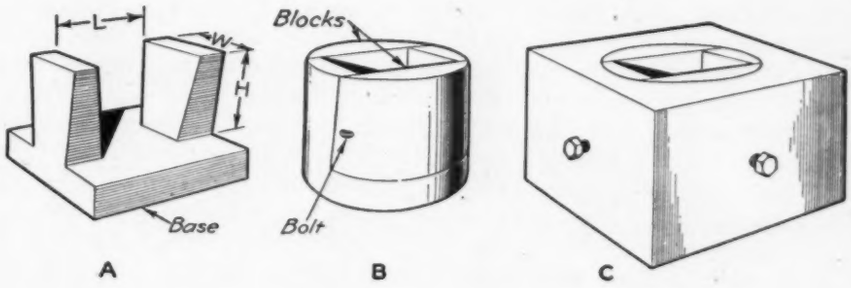


Thus samples of a batch of springs could be checked by deflection in the setup, with springs which either cracked or failed to return to their original shape indicating a poor batch. *Fred Lettino, Astoria, N. Y.*



Block Helps to Center Cutter Over Shaft for Keyway Milling

There are many elaborate methods of centering a milling cutter over a round shaft for cutting keyways, but the simplest and fastest we have found requires the making of only one small fixture.

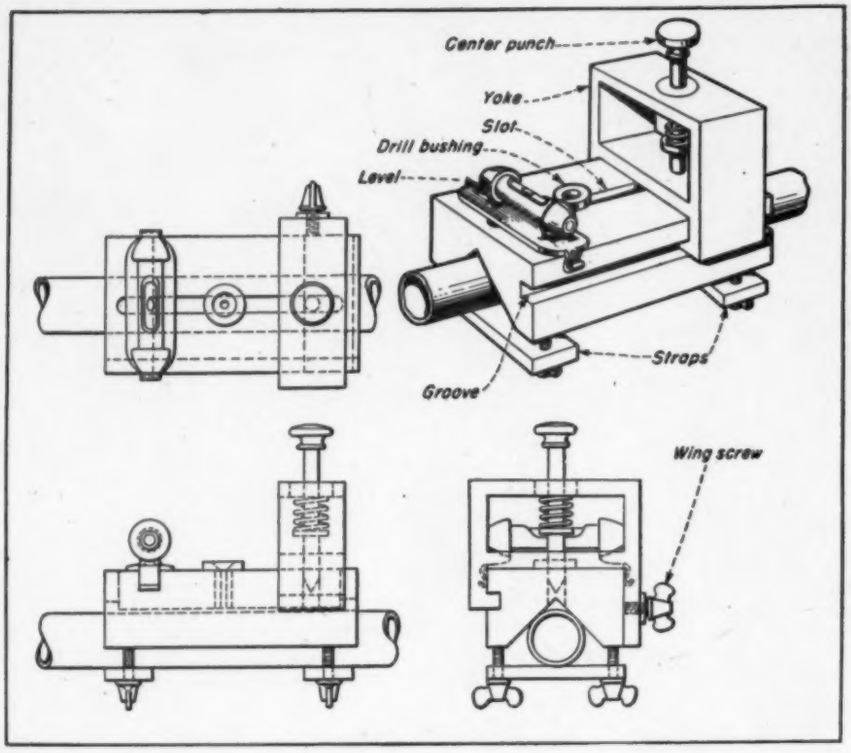


Rectangular Hole Formed in Block Using Only Common Machine Tools

A rectangular hole in a block of metal is a difficult shape to form unless special machine tools are available. There is a method, however, of making such a hole using only common tools.

A base, shown at *A*, is first machined. The dimensions *L*, *W* and *H*, the finished dimensions of the hole, are finished on a shaper or mill, with allowance for draft made if necessary. Two blocks are assembled to the base, on either side, and are bolted through drilled and tapped holes. Then this assembly is turned in a lathe to a convenient size, as at *B*, allowing enough material around the hole for strength. Finally, a die block is bored to take the assembly with a snug fit. See detail *C*. Two large bolts are added to the die block to allow the assembly to be held tightly in place.

This method is not only simple and rapid, it also allows the sides of the hole to be lapped easily during the process. *Fredrico Strasser, Santiago, Chile.*



V-Block Guides Punch and Drill For Shaft Layout and Machining

Layout and machining of small holes in pipe or round stock can be made accurate by using this glorified V-block and various attachments, which include a drilling jig and a centering punch.

The basic V-block is shaped from steel and is provided with a slot through the face of the block to the apex of the V large enough to accommodate a number of drills and punches, and a groove along one side of the block to retain the yokes to be used. Straps are fastened under the shaft being worked to the block by wingscrews in holes drilled and tapped in the bottom of the block.

Yokes suitable for positioning drills and punches are made by bending flat stock to the shape shown in the illustration, and by welding in the horizontal support. A wing screw on the side of each yoke can be used to clamp it in position to the block.

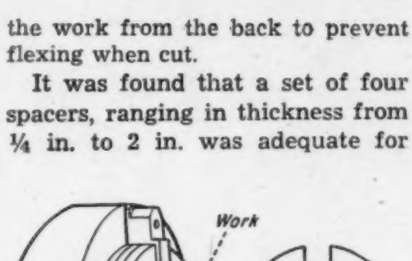
A centerpunch is mounted in a yoke by drilling out a large hole in the top of the yoke, inserting the punch, collar and spring to form a spring-loading device, and filling the hole to the punch diameter by using a brass bushing. A number of hardened drill bushings can be used directly in the slot, as shown, or a drilled yoke can be used to provide a means for clamping them.

For use in locating and layout work a bubble level is added to the top of the block. This will aid in locating a line along the top of a shaft for a keyway. *George Holman, Marissa, Ill.*

Spacers Back Up Turning Work To Support Small, Thin Stock

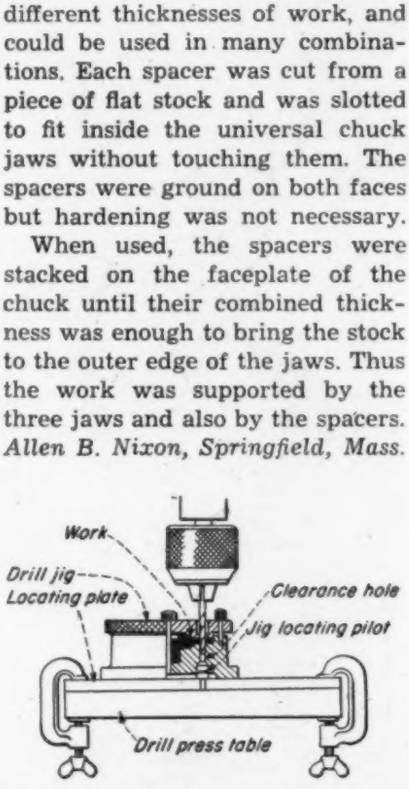
For lathe work which is too small and too thin to support itself firmly when the chuck jaws are reversed, but which cannot be held easily in any other way, a number of spacers will both bring the work out to the edges of the jaws, and will support the work from the back to prevent flexing when cut.

It was found that a set of four spacers, ranging in thickness from ¼ in. to 2 in. was adequate for



different thicknesses of work, and could be used in many combinations. Each spacer was cut from a piece of flat stock and was slotted to fit inside the universal chuck jaws without touching them. The spacers were ground on both faces but hardening was not necessary.

When used, the spacers were stacked on the faceplate of the chuck until their combined thickness was enough to bring the stock to the outer edge of the jaws. Thus the work was supported by the three jaws and also by the spacers. *Allen B. Nixon, Springfield, Mass.*



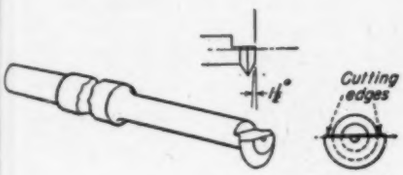
Jig Locating Pilot Speeds Work And Reduces Breakage of Drills

When small holes are to be drilled with a drill jig time can be saved in lining up the jig to meet the drill when the jig is provided with clearance holes that pierce the jig and locate it directly under the drill.

A locating pilot is pressed into a flat plate and the plate is fastened to the table after the pilot is indicated to be perfectly in line with the drill point. This can be set up

for future use by clamping the plate to the table, drilling a hole for the pilot, inserting the pilot and then centerdrilling the pilot. Thereafter the plate can be located by indicating the drill in the centerdrilled hole in the top of the pilot.

This method is recommended for use where fine drills are used and where accurate location of the jig in respect to the drill will save drill breakage. *Fritz L. Keller, Bloomfield, N. J.*



Threading Tool Has Many Uses

This drawing shows a threading tool that can be used for both internal and external, right-hand and left-hand threading work. The 60° angle is ground 1½° off its horizontal axis to give the tool some clearance.

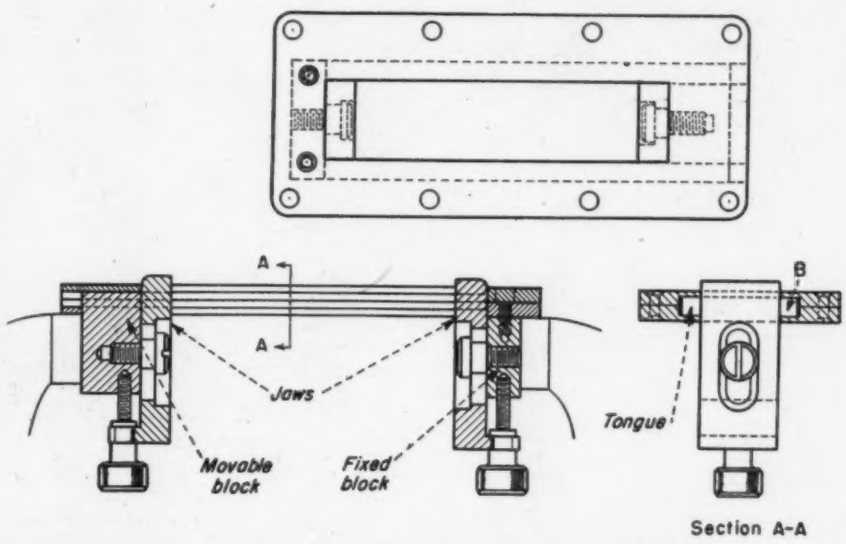
Best results are obtained with this tool when fine threads down to about 20 threads per inch are being cut. *Peter Riggio, Elmhurst, N. Y.*

Stock Sizes Grouped in Bins To Speed Correct Selection

Here is an idea that is applicable to the storage of many different kinds of stock, small tools and other shop materials. An arrangement of such things as drills, collets, bar stock, wire and pipe can be made in a storage bin so that a particular size of each can be picked out quickly without resorting to measuring the diameter or size of the material.

With a storage rack of four compartments, numbered from one to four, as in the drawing, drill rod, for example, can be arranged as follows: All sizes that are multiples of a quarter inch are placed in the first compartment, all multiples of an eighth are in the second, all multiples of a sixteenth in the third and multiples of a thirty-second in the fourth compartment. In this way it is possible for anyone familiar with drill rod sizes to pick out a piece of 3/32-in. drill rod from the fourth compartment by differentiating it from the nearest other sizes—1/32-in. and 5/32 in.—by eye.

For stock of larger size the labels might be larger, but if the system of grouping all multiples of a common denominator are placed together the selection of the correct size is both quick and accurate. *Henry Gifford, Bronx, N. Y.*



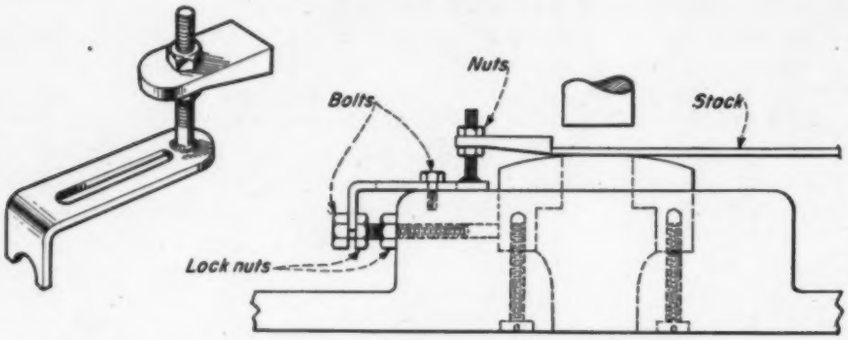
Improved Vise Grips Thin Stock With Tongue-in-Slot Jaw Blocks

Plate vises for holding thin work often prove awkward to use due to the method usually employed for setting the jaw height above the base plate. The vise sketched in the illustration was designed to obtain maximum jaw surface in contact with the plate to be gripped, and to allow setting of the jaw height by screw action.

The vise consists of two flat plates, two jaws and two jaw blocks, plus the necessary adjusting and holding bolts and screws. The plates are cut through in the middle to allow the two jaws to ride through them. In addition, the plates have been milled on their mating surfaces to provide a pair of slots in which two tongues of the adjustable jaw block can ride.

The jaws themselves are clamped to the jaw blocks by screws, and height adjustment is made by loosening the two screws, adjusting the two nuts on the jaw-block bolts for height, and re-tightening. The fixed jaw block is held to the top plates by capscrews, while the other jaw block slides along with its tongues in the slots between the plates.

This design has proven superior to other common vises, and has the added advantages of having no loose parts to become lost and a fine height adjustment. *Clifford T. Bower, Decatur, Ga.*



Slotted Strap Adjusts Feed Stop Both Horizontally and Vertically

Common feed stops on punch-press blanking dies rely upon makeshift bench adjustment for correct alignment to perform their function. An adjustable feed stop can be easily installed on the die holder to eliminate hammering and rough setting of the stop, and also to make the alignment of the stock accurate.

A slotted strap is bent to the form of the die holder outline and a stud is welded to the face of the strap to carry the stop and two retaining nuts. Holes are drilled and tapped in the die holder to take a tightening bolt which passes through the slot in the strap and an adjusting bolt which carries two tightening nuts. The bolt on the side of the die holder fits in a shallow cut in the strap to align the strap properly. The bolt through the slot in the strap is to lock the stop in position after adjustment.

Since the die holder hay be used with many different dies, this stop will be useful for many setups because it can be adjusted through a wide range. *Burnett Menkin, Bronx, N. Y.*

Accurate Multiple Threads Cut By Using Vernier on Compound

For occasions when standard methods of cutting a mulitple thread on a lathe are not practical or possible, this system will give accurate results with little effort on the part of the operator.

To insure four-place accuracy, a vernier scale, marked on a milling machine, is added to the spacing collar on the compound rest. The tool is set up as usual, with the comopund rest turned 30° to the axis of the crossfeed. After the first cut has been made, instead of rotating the work to a new position, the compound is advanced twice the pitch of the thread. This makes an advance equal to the pitch on the work, and the second cut will be in correct position for new thread.

All succesive multiple threads are set off in this manner, using the vernier on the spacing collar for accurate setting. Although the marking of the vernier is a chore, it is a good addition to any lathe and can be used for many other jobs. *Everett Odell, Wallkill, N. Y.*

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Forty-ninth Selection--George C. Allen's Fly-Cutter Discussion

Overhaul Sales System, NMTBA Urged

CHICAGO—Industry, from the top down, must be made conscious that machine tools are the world's best investment.

A better job of selling must be done, starting with careful selection of sales engineers and going through to the closing of sales.

Machine tools have a major part to play in European recovery and in any national defense program which Washington may initiate. These are a few of the conclusions arrived at by the National Machine Tool Builders' Association at its 46th Spring meeting at the Drake Hotel here April 8-9.

A sales panel, with three builders, two distributors and a slaes consultant as members, was a feature of the program. Raymond Moley, associate editor of *Newsweek*, spoke at the dinner April 8. He stressed his belief that a large part of the goods and credit under ERP should be channeled to men and companies in the countries involved, rather than to a group of political governments. He said that "We must see that our aid reaches those who can rebuild free economies in Western Europe."

Only 65% Efficiency Seen

It is doubtful whether the machine efficiency of America's industrial plant is 65% of that obtainable with present-day models, charged A. G. Bryant, president of the association and vice president of Cleereman Machine Tool Co., in the keynote message at the opening session.

Mr. Bryant pointed out that the metalworking industry is suffering unnecessarily from obsolescence because 90% of the machine tools in use are of prewar design. Until 1948 models are put to work "we are not paying the wages, paying the dividends or securing the lower costs for consumers that these machines make possible."

It is a shocking possibility, remarked Mr. Bryant, that Russia, because of her newness of her industrial plant, may have an average age of machine tools lower than ours.

Three Reasons for Inertia

American industry could increase output as much as 50% with the same manpower today if it were equipped with 1948 models of machine tools, he said. The reasons for inertia delaying rehabilitation of plant equipment are three-fold:

1. Lack of understanding by the "front office" of the value of up-to-the-minute machine tools.
2. Difficulties placed in the path of business by the Treasury in interpreting tax laws governing depreciation. Such interpretations should be greatly liberalized.
3. Shrinkage of venture capital available for capital expenditure.

Machine tool builders are selling their products today at prices averaging only 50% above the 1939 price level, Mr. Bryant declared. Labor rates, by comparison, have risen 106% and wholesale commodity prices 111%. This is one reason why machine tools constitute industry's best investment.

There is immediate need for $122 million in U.S. machine tools in ERP nations, said Mr. Bryant, who based this estimate on reports from competent sources abroad. The enabling legislation for European recovery includes authority for the administrator to negotiate for machine tools.

The industry does not concur in the recently expounded recommendations that scanty government reserves of machine tools be shipped abroad, Mr. Bryant emphasized. Those reserves instead should be held for future emergencies.

Executives Seen Needed

M. A. Hollengreen, president of Landis Tool Co., reporting as chairman of the Government Relations Committee, outlined the reasons given to Washington officials and members of Congress for including machine tools in ERP. He declared that the machine tool industry as well as other industries, will have to loan men of executive caliber to the ERP administration if the job in Europe is to be done well.

Commissions from both Holland and Norway, in this country to select surplus machine tools under a credit allowed by WAA, have had little or no success in getting what they need, according to Mr. Hollengreen. He said that some used U.S. machine tools are being offered to Austrian buyers at higher than new machine tool prices, with no guarantee that the machines will fulfill the claims made for them. Such transactions are harmful to the machine tool industry.

Shipments Held Up

The State Department does not know how many machine tools are being held in this country because export licenses have been refused for shipments to Russia, Poland and Czechoslovakia, revealed Tell Berna, general manager of the association, in his annual report. The machines now stopped were booked by builders months ago when Washington was encouraging trade with these countries. The resulting financial tie-up is serious for a number of builders.

Mr. Berna said that no such restrictions have been imposed by Great Britain, France, Sweden or other Western European countries. He described the present set-up in

(Continued on page 102)

Officers and directors of the Cincinnati Bickford Tool Co., Cincinnati, Ohio, machine tool builders, elected recently are shown left to right: L. Lee Schauer, vice president and chief engineer; Onzi E. Schauer, president and general manager; George P. Gradolf, chairman of the board and treasurer; Paul E. Heckel, secretary, and Neil C. Schauer, vice president and sales manager

Washington for handling machine tools in a defense program. The National Security Resources Board under Arthur M. Hill will be in charge of production requirements and the Munitions Board will represent all claimant agencies.

Other Nations Gaining

The way in which export licenses are being handled throws machine tool business to competitors in other nations, asserted Ray F. Ingram, chairman of the Committee on Foreign Affairs and vice president of Landis Tool Co. No U.S. machine tools will be displayed at the Paris Fair this Spring by agreement among agents and dealers, he said. There are too many shows abroad and importers should get together and agree to stage a good show every two years, thus elimniating displays at so many annual fairs, he said.

Operations of business has become a gigantic guessing game and the only hope of guessing right is to know the determinable cost elements of your business, pointed out Arnold K. Brown, chairman of the Committee on Fiscal Affairs and vice president of Brown & Sharpe Mfg. Co. He appealed to builders to watch costs when the industry is operating at a comparatively low level in a high-cost labor and material market.

Public Relations Stressed

Public relations, like charity, begins at home, said Jerome A. Ratterman, chairman of the Committee on Public Relations and president of Monarch Machine Tool Co. Certain groups are "thought leaders" in every community: your own employees, public schools, libraries, ministers, various clubs and associations, foremen, unions, radio stations and newspapers. He outlined what can be done to make proper use of each group in telling industry's story. He suggested that the range of subjects discussed with foremen is too narrow and that such topics as the free enterprise system, the gospel of productivity and the function of machine tools in raising the standard of living should be treated.

It is our responsibility to keep our selling tools sharp, Daniel R. Weedon, chairman of the Committee on Sales and Service and assistant manager of Blanchard Machine Co., declared in opening the sales panel. The time to improve selling, distribution and servicing methods is now, he said, and the sales engineer must gather information for his home office about his customers, prospective customers and industry in general. The sales engineer also should understand the strong and weak points not only of the product which he is selling, but also of the customer himself.

If machine tool sales are to be increased, customers must be given sufficient information so they can readily determine the earnings per dollar invested, James C. Hebert, sales manager of Jones & Lamson Machine Co., asserted.

Frank R. Palmer, former vice president in charge of sales has been elected president to succeed J. Heber Parker of the Carpenter Steel Co., Reading, Pa. Mr. Parker was named chairman of the board and will continue actively in charge of company policies. Ransford V. Mann, former general sales manager, succeeds Mr. Palmer

Mr. Herbert reported that in practically every case a new machine tool will earn from 35% to 100% on the investment within one year. He told about a thread grinder on which the customer earned 80% the first year. He said if we can only double the customer's output by installing a new machine costing $9,000, we can write off the investment in direct labor savings alone in three years." In many cases production per labor hour can be increased three or four times but maximum sales results will not be secured until bankers and top management are convinced that no other commodity will pay the percentage of return on the original investment as will machine tools.

D. N. Macconel, president of American Machine Tool Distributors Association and president of the Machinery Sales Co., said that his company's slogan is "Don't wait—create, initiate." Much of the sales work must be done before the customer actually puts out an inquiry. The sales presentation then must be made carefully and thoroughly. Supplementing it, or a part of it, is the selling sense which contributes the necessary strategy, the extra sales punch.

Too much reliance is put on shop and technical training, Mr. Macconel asserted. This alone does not make a salesman for every thousand men who know all about a machine tool only one knows how to get an order for it.

Technical Knowledge Discounted

The customer, above all, is interested in what the machine will do for him rather than in the machine's technical details, Mr. Macconel declared. Frequently it is advisable to take a prospect to another customer's plant for a demonstration. At times it is worth the expense to pay a customer's way back to the factory to look at the machines which interest him. When all other things are equal, often sales finesse is the deciding factor in the sale.

The machine tool salesman must give the buyer a service that is equivalent to that of a consulting engineer, said Robert L. Giebel, vice president of the American Machine Tool Distributors Association, and president of Giebel, Inc. A distributor's salesman or a factory specialist should work up through the machine shop, drafting room, tool room, tool layout, production and cost department and sales training. Such training should take five years.

Outlines Qualifications

Mr. Giebel outlined the personality qualifications of a good salesman—first, the economic drive or money hunger; second, the political drive which enables him to influence others, and third, the serial drive which makes him like people and get along well with them. The good salesman must be an expert on timing and also must be an expert listener. He must have the "combined newspoint of a mechanic, a foreman, a superintendent and even a president to present the merits of his machines on their level."

Builders should cooperate with salesmen in the field by providing better literature, better advertising and a planned procedure of training when salesmen come to the factory for information, according to H. L. Tigges, executive vice president of Baker Bros., Inc. He said that his own organization is surprised at how much can be accomplished by a field representative in two or three days at the factory if the visit is well planned.

Bernard Lester, management consultant, urged all builders to chart their sales effort carefully, saying that this process would give them the market analysis required to do a good sales job.

The work of the American Standards Association was described by Vice Admiral George F. Hussey, Jr., secretary of the association. William J. Kelly, president of Machinery & Allied Products Institute, commented at length of the work done by MAPI and its relationship to the machine tool industry.

Detroit

1949 MERCURY MOTOR RATED AT 110 HP. ...CHASSIS, BODY, DRIVE NEW ...TOOL, MACHINERY, BUYING REPORTED EASING

Second in the Ford family for 1949 to be previewed is the Mercury, lowest-priced car in the Mercury-Lincoln division. With a 10% more powerful V-8 motor which develops 110 hp., the Mercury has an entirely new chassis, axles, tires, drive and body.

The motor has a bore of 3.1875, 4.00-in. stroke and a piston displacement of 255 cu. in.

The body is now fender width and very low in keeping with the general trend in body styling. Like the Lincoln it will have independent coil spring front-wheel suspension and low-rate semi-elliptic rear springs which take the Hotchkiss Drive. The rear axle has a hypoid gear. The propeller shaft has dual universal joints. An automatic Borg-Warner overdrive will be optional. Loaded the Mercury will be four inches lower than the present model, the front seat has been increased in width eight inches, the rear six. The passengers sit in the center of the chassis. All shock absorbers are of the direct-acting type. The rear springs have leaf interliners to eliminate lubrication during the life of the car. Larger, self-energizing brakes and a new steering linkage have been added.

3-Point Suspension

For comfort of passengers a new bonded-rubber, 3-point engine suspension reduces vibration, all instruments are in front of the driver, a complete heating and ventilation system is provided, the windshield is wider, the door handles are pull type instead of turn and the rear deck lid is spring counter balanced.

Machinery circles in Detroit find comparatively little to cheer about these days. Manufacturers of machine tools and kindred equipment report that their volume seems to be in a declining phase, not severe, but steady.

Die, jig, and fixture shops also are finding their week-by-week activity reducing modestly and slowly. However, it is of note that the bulk of the average reduction seems to be in the larger tooling shops, where the more important programs are concentrated. The smaller shops, where the odds and ends accumulate, are somewhat busier than they have been.

Employment has thinned out in a few larger Detroit shops, but has been about balanced by scattered gains in the smaller ones; total payrolls are down negligibly from the start of the year—continuing a trend, incidentally, which first began to manifest itself last summer

Rear-Mounted Engine powers this Allis-Chalmers Model G tractor equipped with front-mounted, multiple-row, power-driven seeder, which will plant one to six rows at a time. Seeder can be attached or removed in 5 minutes or less

Delivery promises on tooling continue about the same. They have lengthened negligibly on jigs and gages, but shortened by the same nearly imperceptible ratio on dies. Jigs and fixtures are now procureable in Detroit in an average of about a month; gages within three weeks; sheet metal dies about a month; and forging dies about six weeks.

Loud complaints are emanating both from the foundries and from the shops which machine their castings. The complaints revolve around the quality of the work being produced. Extensive investigations indicate one whipping boy—coke.

All sides agree that the quality of coke coming to the cupolas these days is definitely on the low side. It is small and friable, to the point that one major foundry is briquetting much of the coke it is receiving. It does not burn the way good foundry coke should burn.

The result is metal which is low in carbon content, not consistent from heat to heat. This, of course, reflects itself in the castings. They are of quality which increases both spoilage and machining time, as well as tool breakage. Nobody is happy about the situation, but nobody knows quite what to do about it. Deteriorating quality of coke is something which gives evidence of continuing into the future.

Copper continues to be short, and may prove to be a bottleneck at that distant date when steel shortages lighten their anchorage on automobile output. There is simply not enough copper for world demand. Factors in the industry had hoped to balance out requirements this year, but if the government begins to stockpile the red metal, somebody will be shorted.

So far as the auto industry is concerned, it is not feeling any shortages of consequence today. But increased production later on could be easily cramped by availability of the metal. Each automobile requires, on an average, about 54 lb. of copper for plating, radiators, electrical parts.

Copper Substitute Sought

During and since the war a number of experiments have been run striving to find replacements for copper. Ford is known to have extensively tested aluminum radiators, but has apparently found little hope in its research. Efforts have been made to use aluminum cables, but the attachment of lugs to cables of that metal has proved difficult; if someone finds a substantial connection, the field might be widened. So far as is generally known, the only satisfactory substitution of copper has been in one small carburetor part, where aluminum has replaced brass—definitely a negligible item.

At Kaiser-Frazer Corp., where optimism is as much a part of the atmosphere as oxygen, the company has settled down to production of about 720 units a day, against its earlier 1,000 or so. No change of note is expected from this level in the near term.

Reliance Plans High Output Of Electric Motors

CLEVELAND—Convinced of the future of electrical manufacturing over the next five years, J. W. Corey, president of Reliance Electric & Engineering Co., revealed that his organization now has its new $1.5-million plant at Ashtabula, Ohio, in nearly full production and that plans are formulated to manufacture integral hp. motors of 1 to 20 hp. on a production basis.

Property has been purchased in Cleveland to provide expanded manufacturing activities required for building integral hp. motors of 20 hp. and larger.

An agreement has been reached with Philadelphia Gear Works whereby Philadelphia and Reliance sales staffs will jointly sell these gear motors: 1. Horizontal gearmotor of simplified design, developed by Reliance; and 2. Philadelphia's vertical gearmotor.

In this arrangement, Reliance will supply the motors and Philadelphia Gear Works, said that his firm has spent $200,000 and added 20,000 sq. ft. to their factory to make gears for these new gearmotors, and in addition will use considerable of the existing equipment and plant.

Reliance's basic development activities for the 1 to 400 hp. motors will now be centered in a new engineering, development and service center.

Employment in Reliance plants now totals about 2400, as compared with 1700 a year ago, and a forecast of nearly 3,000 a year hence.

Robert Chestnut Named By Screw Machine Unit

CHICAGO—Robert Chestnut, Edgewater Plant, Aluminum Co. of America, was elected president of the National Screw Machine Products Associaton at the annual convention April 1.

Charles D. Hoyt, Jr., Charles D. Hoyt Co., Mishawaka, Ind., was named vice president and William N. Grass, M. J. Grass Screw Machine Products Co., Buffalo, N. Y., treasurer. Orrin B. Werntz, manager and counsel, was reelected executive secretary and Mrs. Margaret Ballinger, secretary.

AMA Shifts Production Conference to Chicago

CHICAGO—The American Management Association's Production Conference will be held here May 13-14 at the Palmer House instead of Detroit as originally planned.

George Langen

John H. Daum

George Langen, president of the Cincinnati Planer Co., retired recently after nearly 50 years of service. Mr. Langen continues to act as advisor to the board of directors. **John H. Daum** was elected vice president and general manager at the meeting of the board

Plant Expansion In Chicago Area Continues Heavy

CHICAGO—Industrial development programs announced for the Chicago area during the first quarter of 1948 totalled approximately $39,926,000, according to a report prepared by the Industrial Department of The Chicago Association of Commerce and Industry. These programs include the construction of new plants, expansions of existing facilities, and purchases of land and buildings for industrial purposes.

The cumulative total for the first three months of 1948 is more than $7 millions above the $32,166,000 total for the first quarter of 1947. Industrial developments announced during 1947 reached a grand total of about $181,297,000, while the total for 1946 was $184,488,000.

Important metalworking companies are included among those now expanding in metropolitan Chicago. Last month Wyman-Gordon Co., Harvey, Illinois, a well-known producer of steel forgings, acquired the adjacent plant which it occupied during the war for the production of crankshafts for aircraft engines. This facility contains 16½ acres and 19 buildings, and will be used by the Wyman-Gordon affiliate, Ingalls-Shepherd Co., manufacturers of traveling cranes.

Norge Heat Division of Borg-Warner Corp. has leased a 150,000 sq. ft. building at Hammond, Indiana, for use in the manufacture of gas fired water heating and air conditioning equipment, conversion burners and floor furnaces.

50th Anniversary

CINCINNATI—The Cincinnati Planer Co. is observing its 50th anniversary this year.

Originally set up as a partnership in 1898 by Bertram B. Quillen, William H. Burtner and R. A. Holden, a charter of incorporation was granted in 1899 with a capitalization of $30,000. The first planer was completed in April, 1899, and 65 more were manufactured that year. The concern has grown into a $3.5-million corporation and has built up an enviable reputation as a leader in its particular field.

Russell McCarroll Dies; Ford Research Director

DEARBORN, MICH.—Russell H. McCarroll, 58, director of chemical engineering and chemical and metallurgical research, Ford Motor Co., died March 31 in Mercy Hospital, Bay City, Mich., of a cerebral hemorrhage. He was returning from a trip to northern Michigan where he was looking over fishing sites with a friend.

Mr. McCarroll assumed his directorship in 1946, after serving many years in important positions at Ford. He held more than 50 patents, chiefly in the field of metallurgy. He directed the development of centrifugal casting and of cast steel crankshafts, valves, push rods and other parts of the modern automobile.

He invented a process used by Ford to make artificial leather and devised a system of coke oven fuel handling to get by-products.

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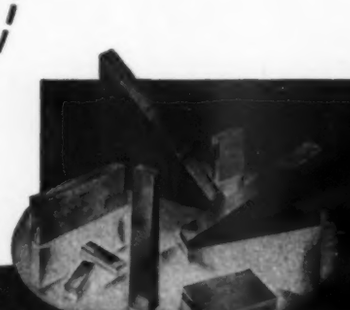

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Methods of Work Clamping—I

Courtesy Giddings & Lewis Machine Tool Company

Effective clamping of workpiece for machining takes into account:

(1) prevention of shifting or rocking while being machined, and

(2) reinforcement of the work to prevent inaccuracies or poor finish resulting from distortion.

The function of a clamping device is to hold the work against some rigid surface of positive alignment and maintain it securely in that position. For example, a T-bolt clamps a workpiece down onto the horizontal surface of a machine table, while another form of clamp, usually a jack, may be used simultaneously to hold the piece against slot blocks in the table T-slots, thus squaring the work in relation to the machine spindle.

Should Be Parallel

Figs. 1 and 2 illustrate two common applications of clamps. The reason for showing them is this: Too often such clamps are not blocked up sufficiently to bring their bearing surfaces parallel with the work surface. This is very important. A cocked clamp is not effective in holding the work down, because it does not press the piece directly against the supporting surface.

It is also important to place the work in relation to the T-slot, so the T-bolt is as close to the work as conditions permit. This practice will apply clamping pressure more effectively

If a workpiece does not permit of a conventional setup on a machine table, it can be fastened to an angle bracket with C-clamps. In Fig. 3, note that bracing jacks are placed between the work and table to prevent the former from slipping downward. Bracing jacks perform the same function as blocks, but have the advantage of being adjustable.

Blocking devises are therefore essential in many situations, to act as stops to prevent the work from shifting or sliding out of position. In Fig. 4, both ends of the vertical sidewall of a casting are maintained in alignment on the table by a slot block and a jack block at each end. Slot blocks can be precision made to locate the work parallel to the bed ways and square to the feed movements of the machine.

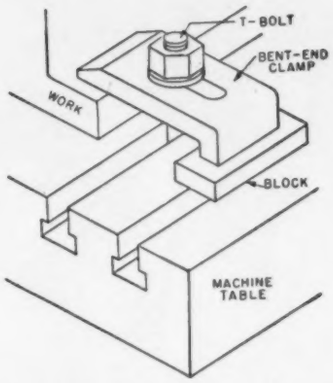

Fig. 1—Always block up the bent-end clamp so that its bearing surface sits firmly on the work. (Fig. 226)

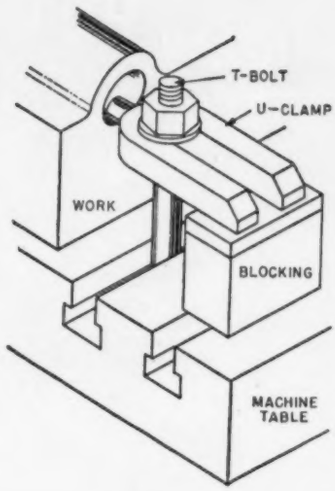

Fig. 2 — U-clamps that bear in holes, particularly those near the bottom of the piece, provide adequate hold-down power

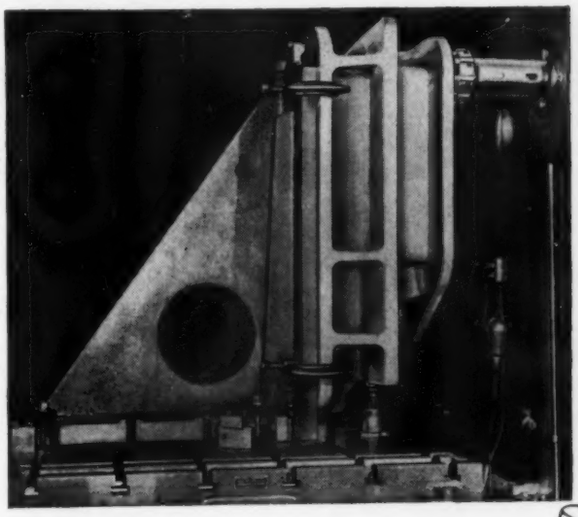

Fig. 3 — C-clamps hold a casting to the vertical face of an angle .b r a c k e t; blocks support the piece against sliding downward

Accessories Aid Clamping

Proper orientation of the workpiece to the cutting tool often prevents clamping the part to the table or floor plate. In such cases, the part can be clamped to angle plates fastened to the machine table.

Box-type angle plates have two

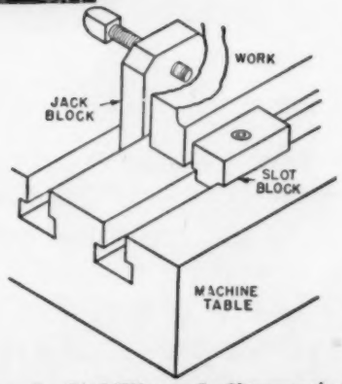

Fig. 4—Stability and alignment of a setup on a T-slotted table are secured with slot and jack blocks

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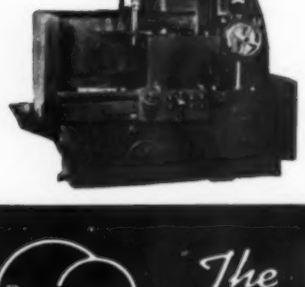
THE METHOD: *Remington Rand Engineers chose a No. 18 Blanchard Surface Grinder* . . . 113 print wheels are simply and quickly placed on the 36" magnetic chuck. . . .

THE RESULT: *which of course governed the choice of the most suitable machine* . . . two chuckloads or 226 accurately sized pieces (452 surfaces) per hour. Difficult grinding jobs are made simple with Blanchard Grinders.



Whether your flat surface grinding job is simple or seemingly difficult, Blanchard Engineers will gladly assist you in arriving at the most profitable solution. Avail yourself of this free, non-obligatory service.

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Methods of Work Clamping—II

Courtesy Giddings & Lewis Machine Tool Company

uses: (1) to block up the work on an acurate horizontal surface, and to provide an accurate vertical clamping surface, as in Fig. 5. In the latter example, the piece is held in a fixture, which in turn is clamped to the vertical face of the angle plate with standard clamps and T-bolts. A slot block under the fixture prevents it from shifting downward.

Round Work

The problem of clamping round work is met effectively with V-blocks. A pair of open-side V-blocks are particularly useful for holding and aligning bars and tubes of various lengths and diameters. Fig. 6 shows a setup for keyseating a tube. The V-blocks are self-aligning with respect to the table T-slots by reason of keys that fit the slots snugly.

Fixtures simplify clamping, particularly for repetitive workpieces and those awkward to hold or to orient with respect to the cutting tool. For example, Fig. 7 illustrates how an odd-shaped piece can be clamped conveniently in a fixture. Two cross clamps hold the finished body of the piece in V-shaped supports; a long T-bolt and strap pull down the two legs against jack supports, which are adjustable to compensate for surface irregularities. By this setup, machining of the legs can be done in proper angular relationship to the cylindrical body of the piece, and the latter cannot shift under machining pressure.

Irregular Work

Ingenuity is required to obtain a stable setup of irregular work that has no flat surface available for clamping purposes. In Fig. 8, the pipe bend is supported on wood blocks, which tend to absorb vibration. To hold the bend down against these blocks and a bracing jack, a cross strap and two T-bolts are applied. Angle braces bear against the flange to prevent laternal movement.

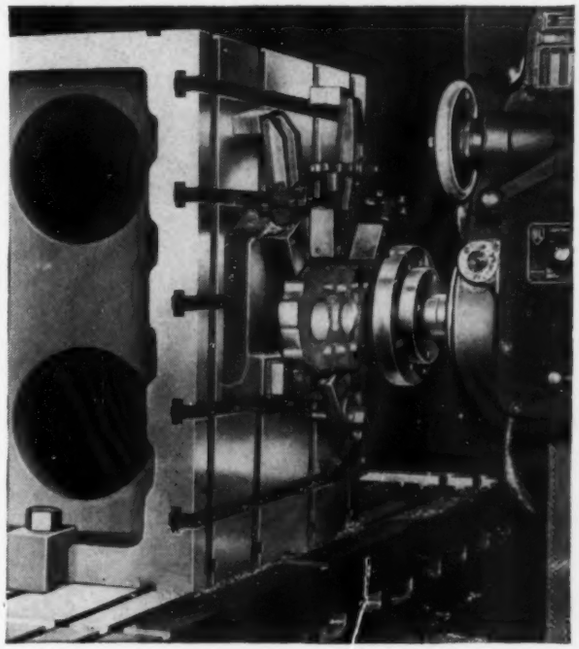


Fig. 5— Accessories like box tables extend possibilities for orienting work (as in fixtures) to cutting tool and convenient clamping

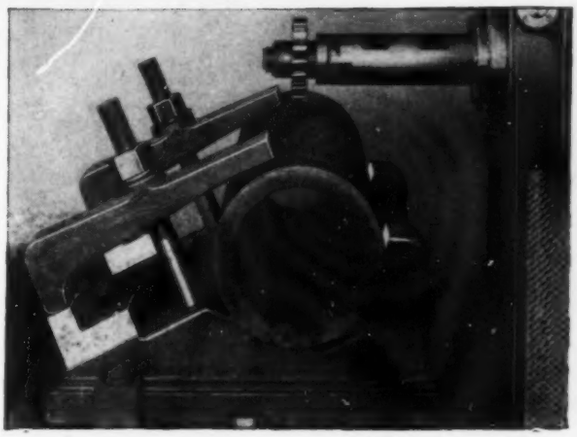


Fig. 6 — A pair of open-side V-blocks (self-aligned with table T-slots by keys) permit quick accurate setups for operations on cylindrical parts

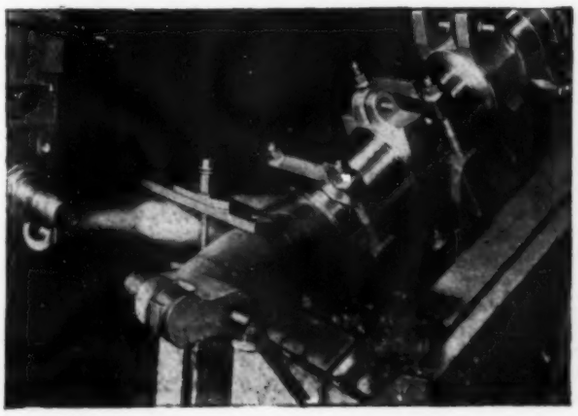
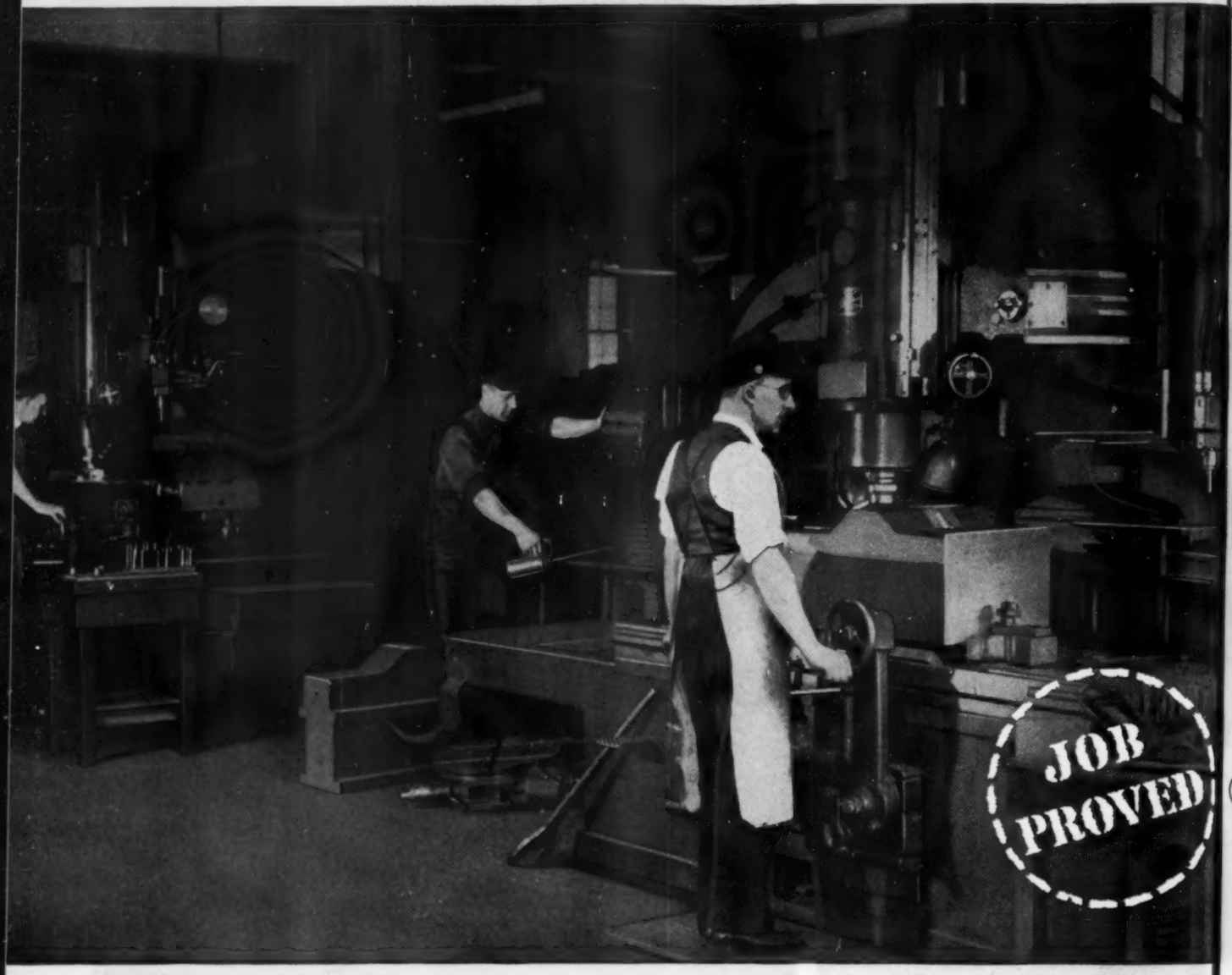


Fig. 7—If awkward parts are produced in any quantity, it will pay to make fixtures with integral alignment and clamping devices

Cutting Out the "Chatter" Improves Quality



SUNOCO WAY LUBRICANT...

Increases Accuracy, Eliminates Need for Extra Grinding

A manufacturer of steel products was having trouble with the lubrication of five milling machines. The tableways and cross-slide ways were becoming coated with heavy, dark brown deposits which caused severe chattering. An extra grinding operation had to be specified, and many pieces were rejected because of the quality of the machining.

An outstanding performer, Sunoco Way Lubricant, was recommended by the Sun Engineer who was called in for consultation. With this lubricant in use, table chatter was completely eliminated. Better tolerances were obtained. The additional grinding step was no longer necessary.

Quality of the dies that are being milled has been much improved, and the management now states it would not use any other lubricant on these machines.

Increased production and improved quality are typical results in plants where Sun "Job Proved" lubricants are used. In machine shops, in power plants, in quarries, mines, mills and factories, Sun "Job Proved" lubricants help to "produce more for less." For full information on the Sun lubricants for your machines, call the nearest Sun office, or write Department AM-4.

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Methods of Work Clamping--III

Courtesy of Giddings and Lewis Machine Tool Company

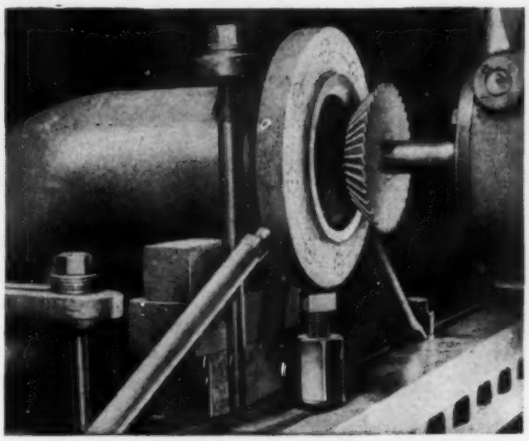

Fig. 8—Irregular parts like this pipe bend can be setup in a stable manner by a suitable combination of blocks, straps, T-bolts, bracing jacks and angle braces

RULES IN CLAMPING

1. **Always clamp as low on the workpiece as possible.** Use projecting surfaces close to the table or other support. If necessary to clamp high, choose a strong vertical wall that will not distort.

2. **Block to prevent movement.** No amount of clamping pressure alone will prevent lateral shifting under certain conditions. Fig. 9 shows a motor block properly clamped and blocked. Clamps bear in holes near the bottom of the block. Slot blocks inserted in the T-slots of the rotary table both block the part and align it with the T-slots.

3. **Do not clamp over unsupported work surfaces.** Clamp over points that have a solid, uninterrupted wall the entire distance from clamp to supporting bed. If castings have pads on their bases, the clamps should bear only at points over these pads. If the work is set up on blocks as in Fig. 10, clamp close to the blocks.

4. **Shim for adequate support.** Castings should be supported on at least four points, and near the corner extremities. Suppose the piece is placed on four parallel blocks, one at each corner. If the work is found to be resting on only three blocks, wedge shims between the loose block and the work. Clamp close to the shims.

5. **Reclamp when distortion occurs.** Heavy machining operations may induce distortion to an excessive amount. Heavy roughing cuts are likely to relieve internal strains in the casting. If accuracy rather than machining time is the main criterion, make all the roughing cuts and attendent setups, then reclamp for the finishing cuts. Or it may be possible to take the roughing cuts, loosen the clamps, shim the piece to compensate for evident distortion and reclamp the work. This method is particularly suitable for heavy milling cuts over major surfaces of large castings.

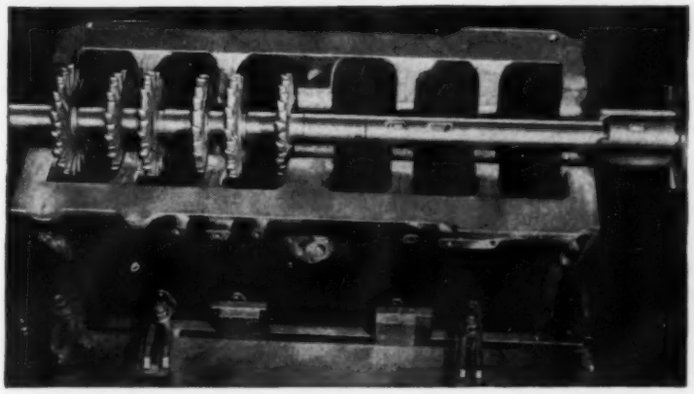

Fig. 9—Alignment and stability of work on a circular table are secured with slot blocks and spaces; hold-down is obtained by U-clamps bearing in holes and on pads near base

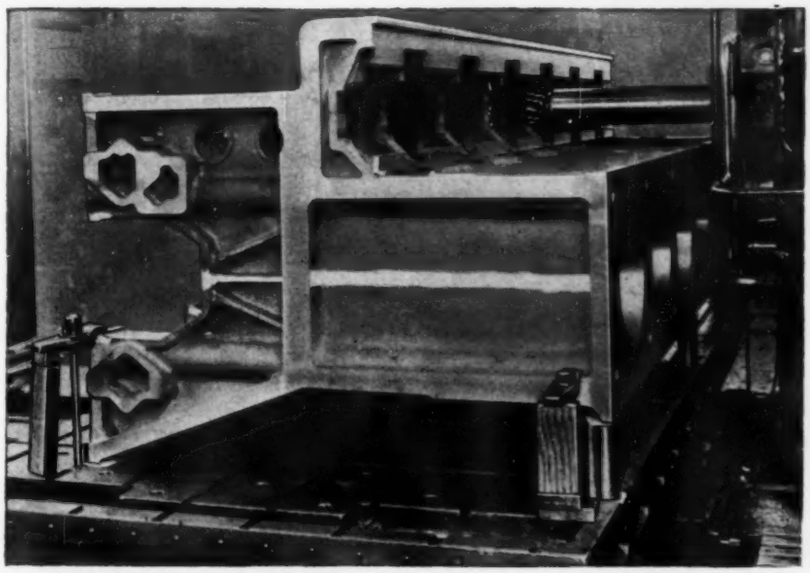

Fig. 10—Cylindrical blocks are placed under the top wall of the diesel-engine casting and clamps are applied adjacent to the blocks

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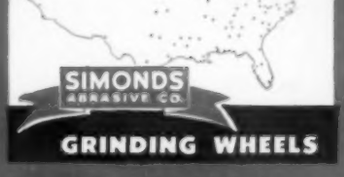

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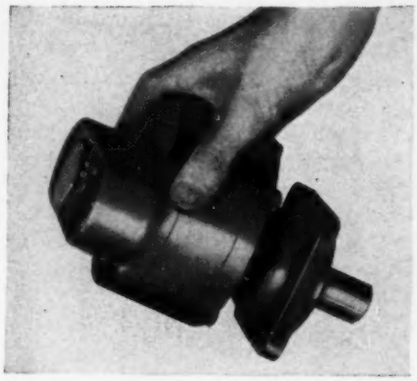
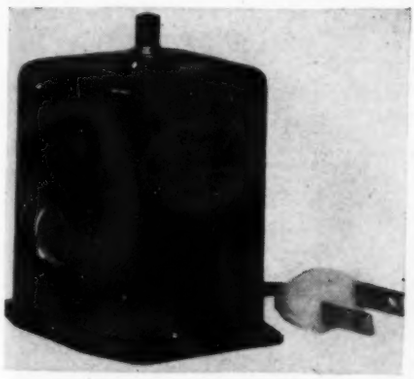
Parts and Materials



Model 5W Pump by Sundstrand Offers Special Pumping Member

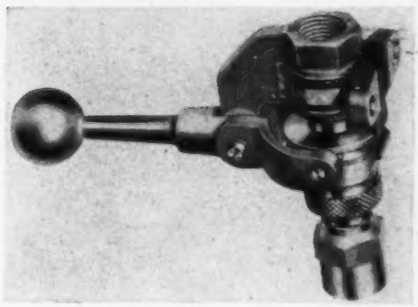
A constant-volume pump for 1000-psi service is offered by Sundstrand Machine Tool Co., Rockford, Ill. Made in 8 capacities ranging from 3 to 10 gpm. at 1200 rpm., unit features a Rota-Roll pumping-member design. The smaller roller or inner member is keyed to a shaft and drives the outer member at a speed 25% lower than speed of the motor. A special tooth-form design is incorporated. Rotating roller and rotor are self-emptying. Pump is suitable for direct-coupling drive only.



MAGNETIZING and demagnetizing of small tools is accomplished by the Duo-Mag, developed by Ace Typewriter Service, 909 Maple Ave., Evanston, Ill. Unit is rated for intermittent use only on 110-120 v., ac. or dc., for magnetizing, and 110-120 v., 60-cycle ac. for demagnetizing. Tool is inserted in unit for both operations

DuPont Chemically Treated Cloth Ends Fog on Windows, Eyeglasses

An absorbent cotton cloth treated with a chemical solution to end fog on windows and eyeglasses, is introduced by E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del. Tests with safety goggles in factory steam rooms have shown that one wiping with the cloth will keep glass clear for hours. Cloth is soaked with an anti-fogging agent and then dried. Treated cloth can be used indefinitely.



3-Way Hand-Operated Air Wave Indexes, Holds Handle in Neutral

A 3-way neutral-position hand-operated valve, No. 1291-N3, is offered by C. B. Hunt & Son, Inc., Salem, Ohio. Called the Quick-As-Wink valve, unit is fitted with a flat spring for indexing and holding the handle in on, off, hold, or neutral position.

Valves are for use with single-acting air cylinders and are recommended for hoists and other applications when raising, lowering, and holding load in an intermediate position is desired. Units are furnished in ⅜ and ½-in. pipe sizes for air pressures up to 250 psi.

Maxitorq Floating-Disk Clutch Has Non-Locking Type Levers

The Carlyle Johnson Machine Co., Manchester, Conn., announces that the Maxitorq floating-disk clutch is now equipped with non-locking type levers designed so that the clutch cannot be locked into engagement.

Single-Phase Squirrel-Cage Motor Utilizes Capacitor for Start Only

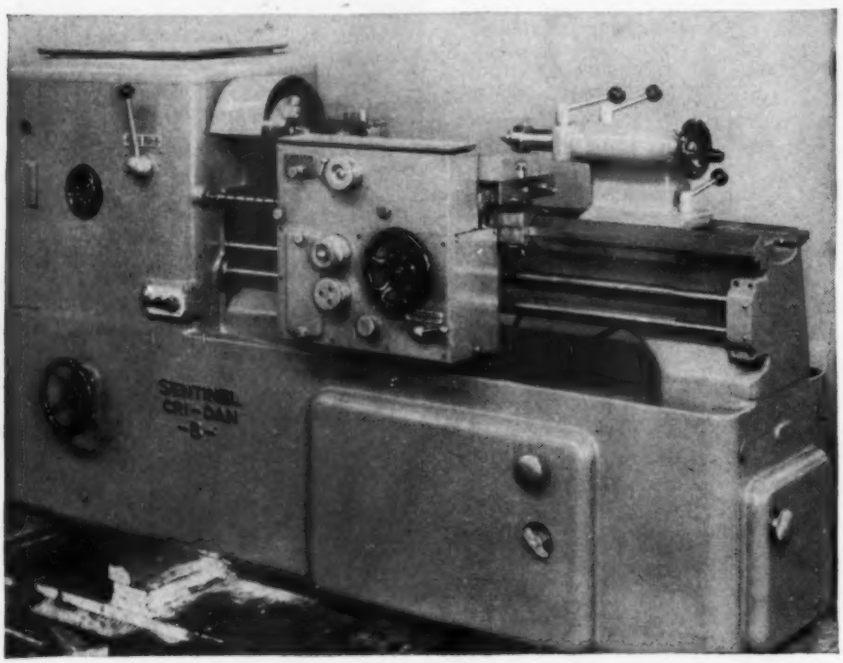
A single-phase Life-Line capacitor-start, induction-run, squirrel-cage motor is available from Westinghouse Electric Corp., 306 Fourth Ave., Pittsburgh 30, Pa. Motors are available in ratings of ¾, 1, 1½, 2, 3, 5, and 7½ hp. Motors, listed as type CAP, utilize capacitor for starting only. The starting switch or relay disconnects the capacitor as motors approach full speed. They then operate on induction-run principle.

Motors have 3450, 1750, 1160 rpm. for 60 cycle, 2875, 1475, 970 for 50 cycles, and 1450 rpm. for 25 cycles.

Two Liquid Adhesives by GE Resist Water and Gasoline

Two modified phenolic liquid adhesives for cementing metals and thermosetting plastics are introduced by General Electric Chemical Dept., Pittsfield, Mass. Known as No. 12507 and 12508, these bonding agents when properly cured, exhibit high shear and tensile strength and high resistance to water, gasoline, kerosene and mineral oils. GE adhesive No. 12507 is said to have good solvent resistance and is recommended for thermosetting plastics because of its flow characteristics. Adhesive No. 12508 is offered for application necessitating high cleavage strength from the adhesive and where higher application pressures are available.

Shop Equipment News



Lees-Bradner's Sentinel Cri-Dan Designed for High-Speed Threading

The Sentinel Cri-Dan semi-automatic high-speed threading machine is introduced by The Lees-Bradner Co., Cleveland, Ohio. Machine is a type of lathe in which the cutting tool is traversed through the cut at rates up to 100 strokes per min. Thread-size or pitch-diameter control is said to be close enough to hold pitch-diameter tolerances to thousandths of an inch.

Machine generates threads using a single-point carbide-tipped tool. The number of strokes or passes of the tool vary depending on the job being performed.

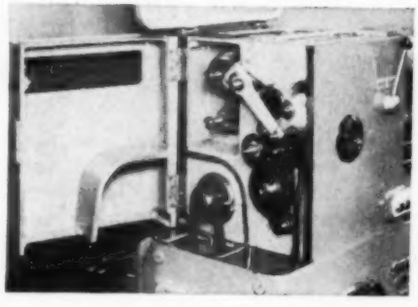
As a tool safeguard, an electric counter can be supplied to shut the machine off automatically for tool change after a predetermined number of pieces have been made.

The headstock and apron are individually oiled by a circulating oiling system. Machine is said to be capable of change over from one assignment to a completely different one in ten to fifteen minutes.

Multi-start threads up to 12 in number can be produced with automatic indexing. Taper threads up to 25° included angle can be cut on the standard machine with the components supplied. Machine handles either internal or external work, right or left hand. Profile of the thread depends only on the tool, enabling the cutting of many forms.

Spindle speed is 200 to 2600 rpm., forward or reverse. Maximum swing over saddle is 4 in., maximum over bed is 13 in. Maximum thread pitch is 6 tpi.

The Cri-Dan Threading Machine was designed and built in Paris. Machines are also built in Shrewsbury, England, and equipped with motors, controls, tooling and fixtures by Lees-Bradner, its distributor in the United States.

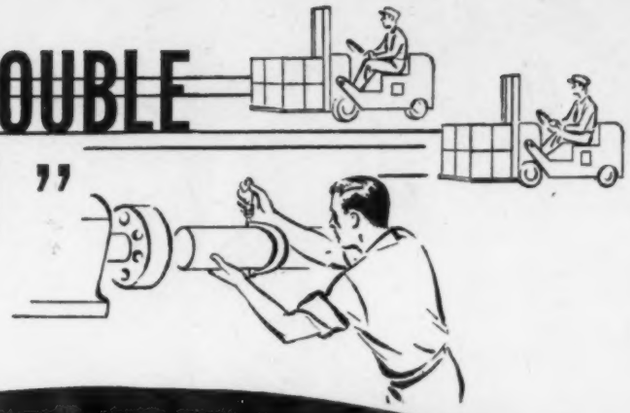


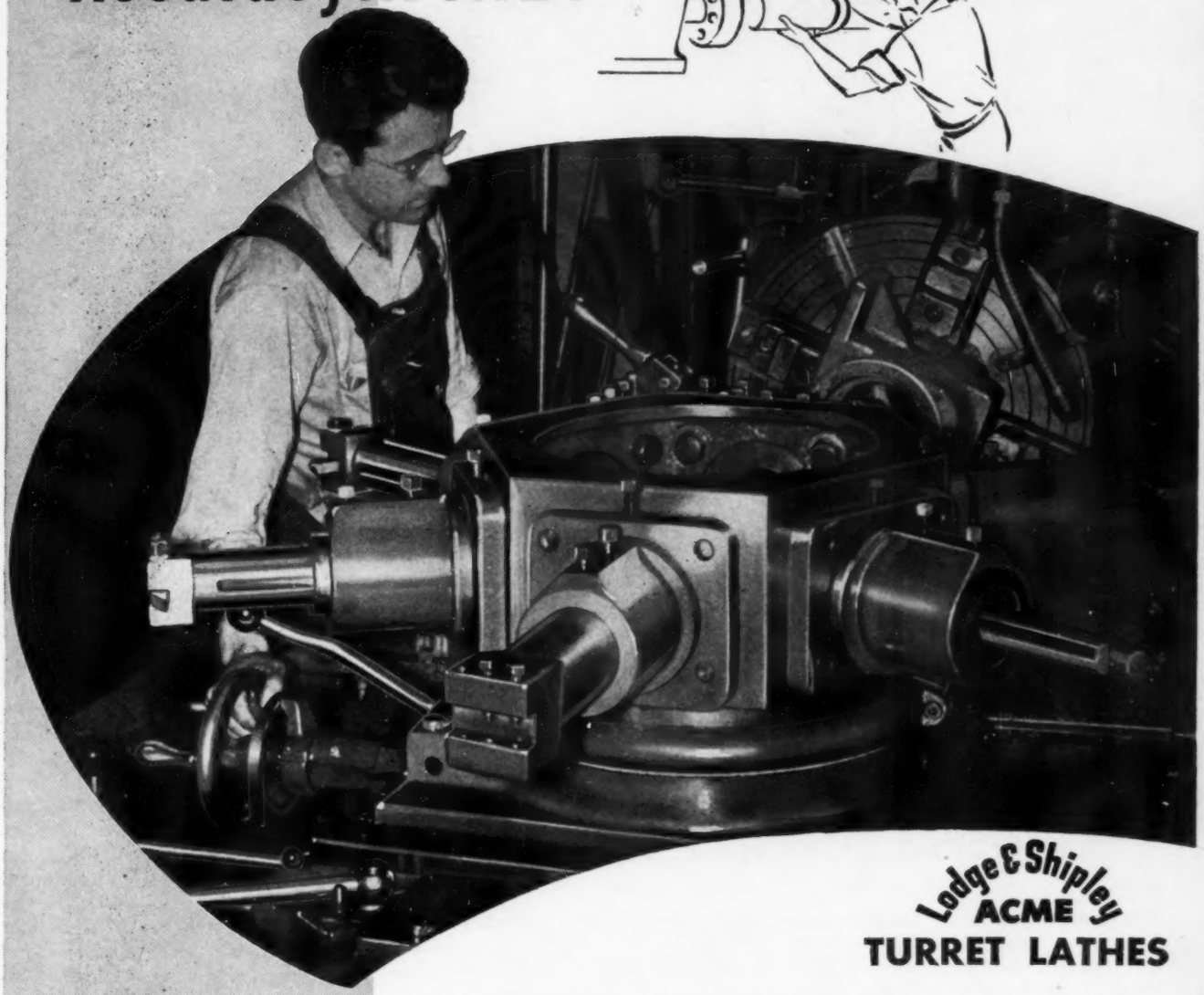
Bar-Stock Feeder Automatically Performs Four Hand Operations

A bar stock feeder called the Pond Production Operator, No. 200, is offered by Production Tool & Die Co., Inc., 572 St. James Ave., Springfield, Mass. Unit performs four hand operations automatically: opening vise, ejecting finished piece, locating bar for next cut, and starting machine cycle.

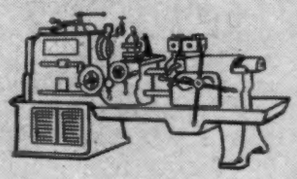
Control unit operates the miller. Cutting time required by the miller determines length of full cycle. Feeder handles round, rectangular, or extruded shapes, and requires 21 x 21-in. floor space. Length of cutoff is 2½ in. on standard plain millers and up to 6 in. on larger type millers. An electric motor of 1/3 hp., or less, drives the mechanical members which actuate the pneumatic parts.

"Output ... about ~~DOUBLE~~ Accuracy..FINE!"





Lodge & Shipley ACME TURRET LATHES



The Lodge & Shipley ACME Turret Lathe line includes lathes designed for every production need, in Ram Type, Way Type, and Saddle Type Models.

Building a long list of well-known heavy machinery for the mining, logging and marine industries of the West Coast, Washington Iron Works, Seattle, Washington, finds ample opportunity to test its Lodge & Shipley ACME Turret Lathes.

Gears, clutches, cams, chain sprockets and many other parts are machined from steel and meehanite castings. In the illustration, for example, a journal bearing housing for a gantry crane is being turned and faced on a 5S Lodge & Shipley ACME Turret Lathe. Summing up the performance of these fine lathes, this owner stated that they are "very satisfied."

Don't pyramid your costs with outmoded lathes . . . ask your Lodge & Shipley representative to show you other amazing cost and production records set by Lodge & Shipley ACME Turret Lathes. Write on your company letterhead for complete catalogs.

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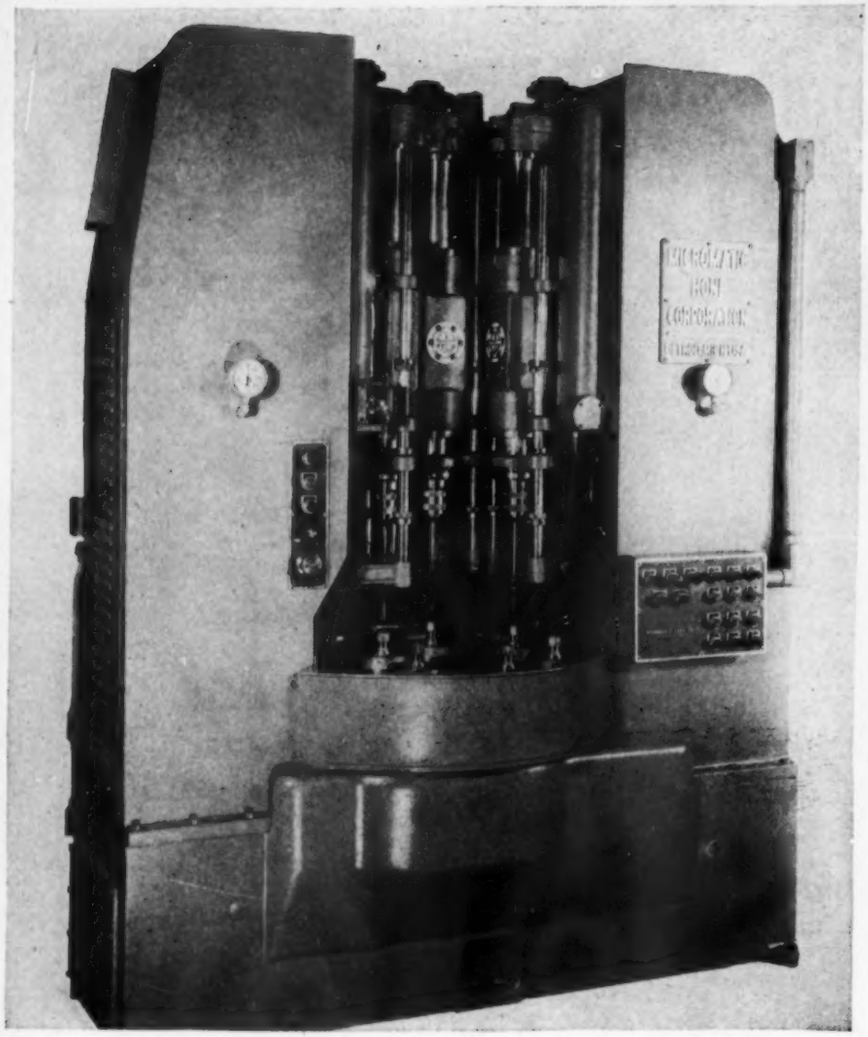


Heavy-Duty Microhoning Machines Controlled, Powered Hydraulically

Heavy-duty multiple-spindle microhoning machines called Hydrohoners are offered by Micromatic Hone Corp., Detroit, Mich. These quill-type machines give the power and control necessary to hold size and finish to close tolerances. Spindles are mounted in quills which in turn are actuated as independent units. Design is said to reduce the weight reciprocated and to eliminate necessity of guide bars. Expansion of the tools and reciprocation of the quills are hydraulically powered and controlled.

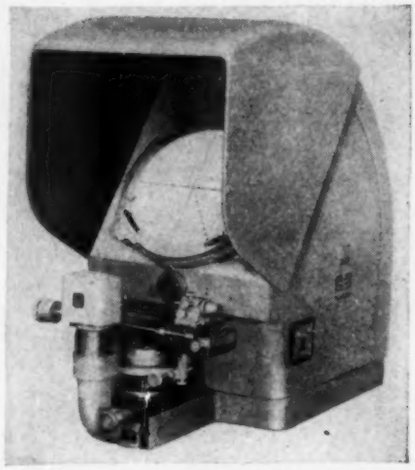
Each quill is mounted on a separate column. Columns are spaced around a common base and indexing table. By interlocking the control panels, operation is automatic.

Machine illustrated is fixtured for work on the cone bore of bearing races. Operation takes place in three progressive steps, making it possible to vary abrasives, feed, and speeds to match the condition of the bore.

Plus and Minus Slide Rule Adds, Subtracts, Converts

A slide rule which adds, subtracts, and converts simultaneously in one operation is offered by the Plus & Minus Corp., 150 Broadway, New York 7, N. Y. Fractions of an inch, decimals of an inch and millimeters can be handled. Scales A and B are graduated in 64ths. Scales C and D are given in the decimal and millimeter equivalents of each of these fractions. Fractions and decimals can be added to, or subtracted from each other without converting them all into either fractional or decimal units and then reconverting the answer into the desired units.

Slide rule covers a range of one inch. Therefore the whole number one must be added to the result in multiples of only the number of times the answers to any problem exceed one inch.



Bench-Type Optical Comparators Offer Different Table Assemblies

Bench-type optical comparators and measuring machines, available in two models with different table assemblies, are made by Jones & Lamson Machine Co., Springfield, Vt.

The BC-7 model offers a choice of three table assembly combinations. Style A offers a 12-in. plain table for comparing the magnified shadow of an object with a master outline, and handles objects to 3 in. in diameter. Style B has a 14-in. table capable of being compounded for inspection of objects with helices. Unit is designed for inspection of irregular shaped parts to 3 in. in diameter and 11 in. long. Style C, with a 16-in. table which can be compounded, is equipped for making lateral measurements. Model will take objects 3 in. in diameter and 11 in. in length. Range of magnification on BC-7 models is from 5 to 125.

The BC-14 model with 14-in. dia. screen offers four varied table assemblies. Model A has a platform-type table measuring 5 x 10 in. Model B has a 16 in. table that can be compounded, and also elevated 1¾ in. vertically. Model C adds a 2-in. lateral table travel to Model B's features, and Model D, illustrated, can be used for the complete measurement of tools and products, incorporating all the features of Models A, B ,and C. Magnifications on BC-14 models are 10 to 100.

...by insisting on AMERICAN PHILLIPS SCREWS

PRODUCTION-WISE – add sunlamp manufacturers to the host of stove, refrigerator, furniture and other modern-minded makers who are cutting production costs via American Phillips Screws. How? By straight, sure-fire, speedy, *automatic* driving that's proof against scars, scuffs, work spoilage. No matter what the pace, the 4-winged American Phillips Driver "stays put" — can't harm or hinder work or worker . . . and you can count on *time savings up to 50%!*

PROMOTION-WISE – American Phillips Screws lend a modern touch — step up the "sell" of whatever you make. They can't snag clothes but they *do* snag *orders!* Showmanship and serviceability both say "specify American Phillips."

4-WINGED DRIVER CAN'T SLIP OUT OF PHILLIPS TAPERED RECESS

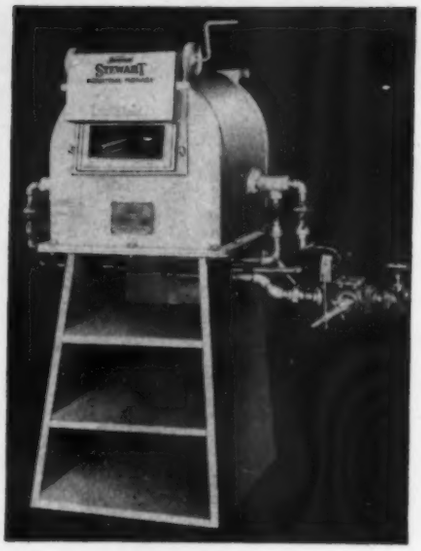
AMERICAN SCREW COMPANY, PROVIDENCE 1, RHODE ISLAND

Chicago 11: 589 E. Illinois St. *Detroit 2:* 502 Stephenson Bldg.

AMERICAN PHILLIPS *Screws*

ALL TYPES

ALL METALS: Steel, Brass, Bronze, Stainless Steel, Aluminum, Monel, Everdur (silicon bronze)

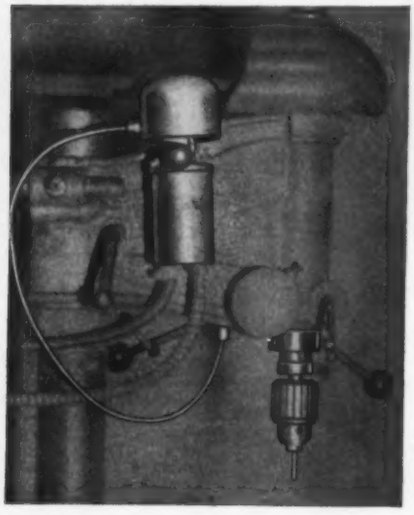


Semi-Muffled Oven Furnace Ranges from 300 to 2400 F.

Sunbeam - Stewart Industrial Furnace Div., Sunbeam Corp., 4433 Ogden Ave., Chicago 23, Ill., offers a small semi-muffled gas-fired oven furnace with a temperature range of 300 to 2400 F.

Uniformity at low temperatures is obtained by increasing air over gas ratio, thus heating by convection. The staggered position of the nozzle-mixing wide-range burners results in a circular turbulence throughout the heating chamber.

Furnace is available in sizes having 4x8x12-in., 6x12x18-in., and 9x15x24-in. heating space.



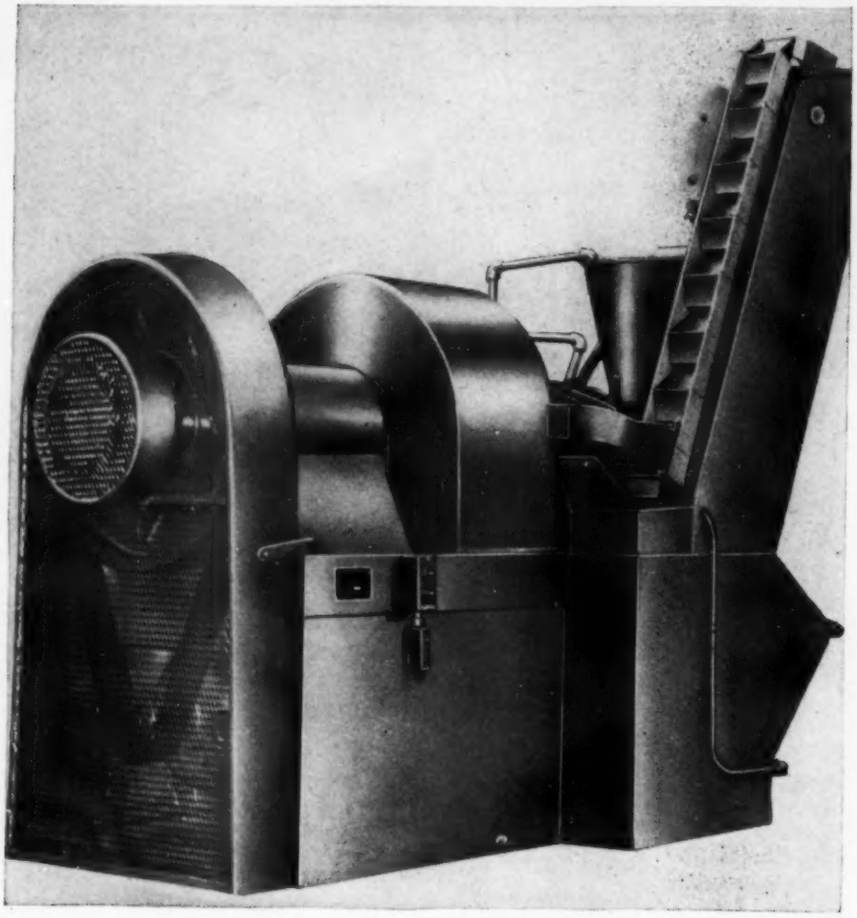
Switch-O-Matic Reversing Control Operated Automatically, Manually

A control for drillpresses, engine lathes, and turret lathes with motors of 220, 440, and 550 v., can be used whenever accurate automatic spindle-reversing operations are required. Made by Switch-O-Matic Co., 124 W. Hadley St., Whittier, Calif., this reversing control unit is said to increase machine production by permitting the threading of nonferrous materials at higher speeds.

Tap sizes are limited only to the chucking capacity of the machine, eliminating the need for many sizes of tapping heads for a full operating range. Control can be used with a multiple drillhead, transforming a drillpress into a semi-automatic multiple tapping machine. It can be operated automatically or manually on intermittent operations without changing the machine setup.

Improved G-C Wire Stripper Cuts Insulation from Wire

General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill., offers the improved Speedex wire stripper, for stripping insulation from all types of wire from No. 8 to No. 30. Hardened steel cutting blades are interchangeable. Stripper can be used as a production tool or hand tool.

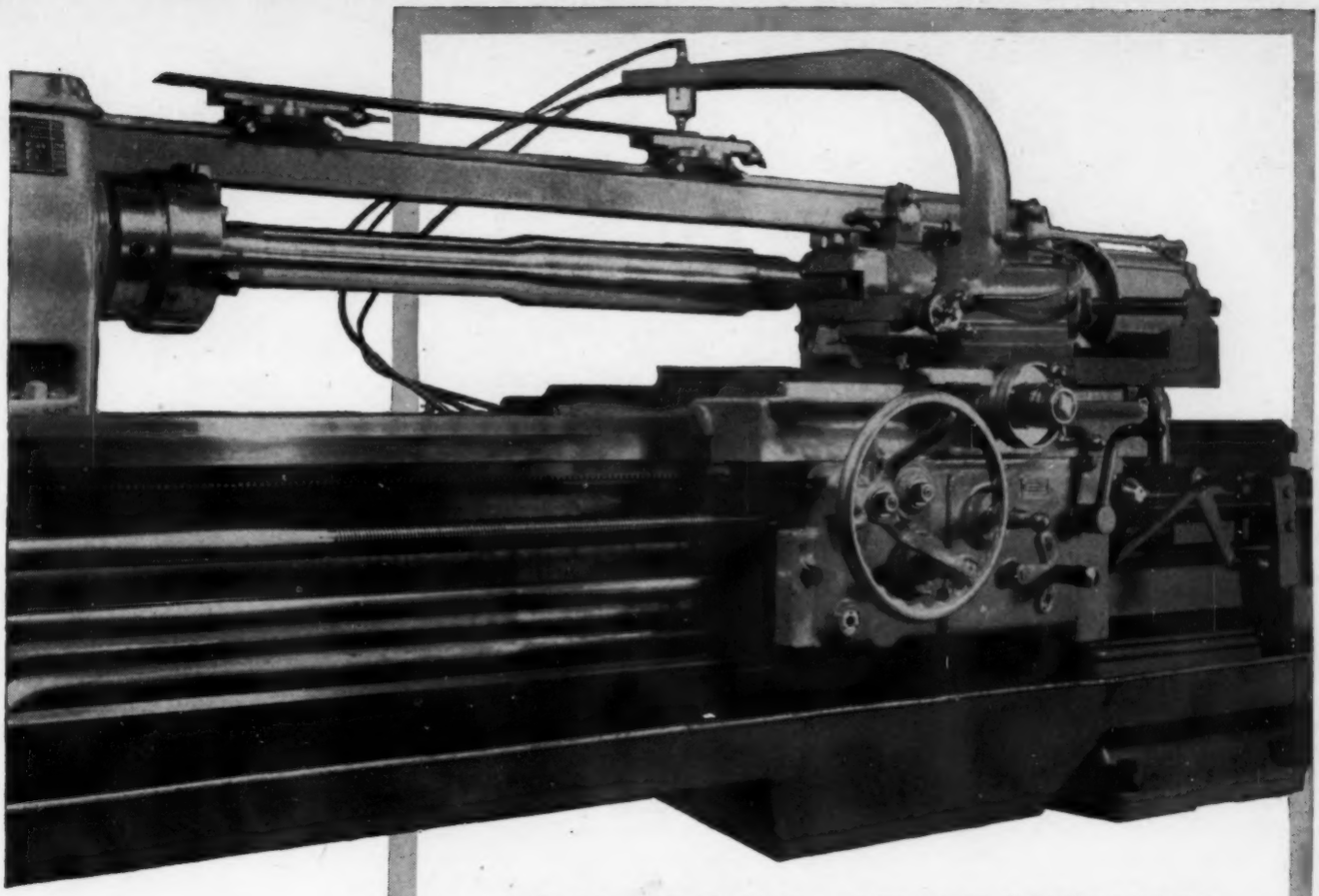


Koehler Automatic Ball Machines Flash, Grind, Lap Steel Balls

A machine that will flash, grind, or lap either low-carbon or alloy steel balls maintaining close tolerances is offered by Koehler & Sons, Summer Ave., Horsham, Pa. This automatic ball machine houses electrical equipment in the base. The floating hub drive pulley is designed so that no bending-moment error is transmitted to the working surface.

Also featured is an automatic conveyor from unloading station to hopper. Spring pressure on the ram is calibrated up to 5 tons and equipped with a safety stop.

Machines are available in three sizes: 24, 30, and 36 in., taking ball sizes from 1/16 to ½ in., ¼ to ¾ in., and ⅜ to 1½ in., respectively. The 24-in. machine has a hopper feed capacity of 150 lb., and an 85-gal. coolant tank in the base.



30% MORE PRODUCTION ...14 LESS TOOLS

with Monarch Air-Gage Tracing

Single-point stepless Air-Gage Tracing from a thin master template is saving 1½ hours production time per shaft on this job.

When turned on a conventional "automatic lathe" with fifteen cutting tools, only 14 shafts were machined in 8 hours. By the new Monarch method, rough turning takes a mere 11.45 minutes; finish turning, 11.08 minutes—and with a tolerance of .002″. The former method required leaving .050″ to .060″ of grind stock; only .012″ to .015″ must be removed after machining on the Monarch. Furthermore, by the old method the pressure of 15 cutting tools belled out the work centers so badly that recentering was necessary before grinding—another operation saved by single-tool Air-Gage Tracing, the Monarch way.

Summarizing; savings are made in machining time, in grinding, in auxiliary operations and handling—and in set-up time, tool sharpening and tool investment. Even more important, the Monarch Air-Gage Tracer Lathe stands instantly available to make similar savings on *all production jobs* in the shop—changeover involves the mere substitution of the master template.

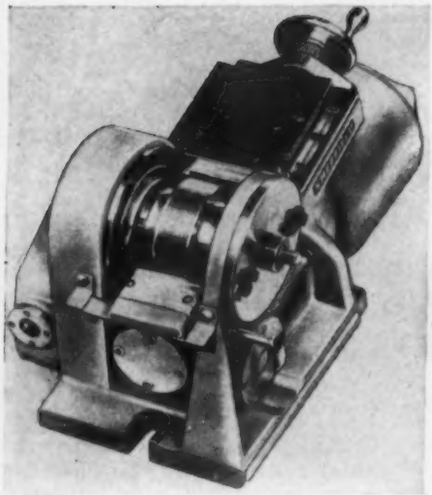
Does that kind of time-saving, money-saving "peak production at a profit" appeal to you? We'll be glad to furnish complete information on how Air-Gage Tracer-equipped Monarch Lathes can meet *your* metal turning requirements.

THE MONARCH MACHINE TOOL CO.
SIDNEY, OHIO

ACCURACY · ECONOMY · LONG LIFE

Monarch TURNING MACHINES

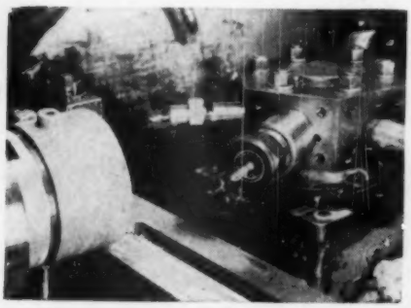
FOR A GOOD TURN *FASTER*—TURN TO MONARCH



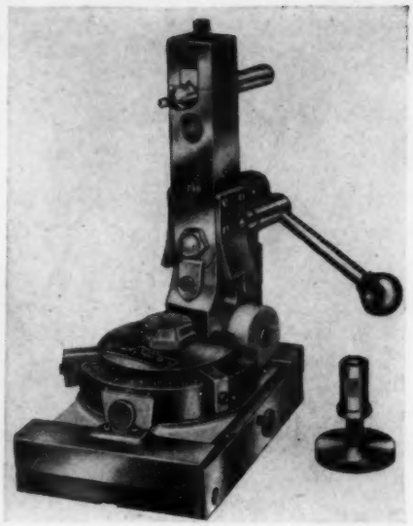
Self-Truing Crushing Device Forms Cast Iron Rolls, Wheels

Sheffield Corp., Dayton 1, Ohio, announces a self-truing motorized crushing device for forming cast-iron rolls and grinding wheels. The self-contained, two-speed unit employs a carbide tool for dressing the form of a Meehanite or other close-grained cast-iron roll. It is then used to crush the grinding wheel, without removing the roll. Device can be mounted on the table of an 8x24-in. or larger wet-type surface grinder.

As roll becomes worn, operator shifts clutch to low speed and feeds tool into the roll until original form is restored. All elements of form are said to be held precisely during the grinding of quantities of parts.



FULL-FLOATING holder for holding taps and reamers during precision operations is made by Erickson Tools Div., 2309 Hamilton Ave., Cleveland 14, Ohio. Parallel and angular misalignment is prevented by use of Neoprene insert and floating ball-and-socket joint which allows proper alignment with center line of spindle. Standard Erickson No. 400 Series collets are used with a range of 1 to ⅛ in. in increments of 1/32 in.

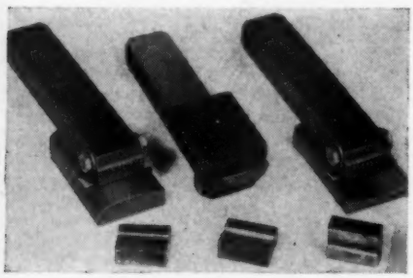


Radius & Angle Wheel Dresser Employs Micrometer Feed to Wheel

The Model A radius and angle wheel dresser is offered by Matco Tool Co., 2834 W. Lake St., Chicago 12, Ill. Unit can form concave or convex radii with any two angles tangent in one continuous motion without stopping. A 180° half-circle attachment for full concave dressing insures complete coverage of wheel forming.

Featured are the micrometer feed to the wheel, and a self-centering cam action movement.

TOTALLY-INCLOSED, fan-cooled, wound-rotor motors are offered by Allis-Chalmers Mfg. Co., Milwaukee, Wis. Motors are built with an improved tube-type air-to-air heat exchanger which permits reduction in size. Motors can be built with stainless steel ventilating tubes, fans, and end plates and cast iron terminal boxes and collector-ring enclosures. Illustrated is a 500-hp., 705-rpm., 2300-v. motor used for driving a centrifugal pump



Devices for Annular Marking Stamp Around Flat Surfaces

A line of locating-guide stamping devices for annular marking is manufactured by New Method Steel Stamps, Inc., 147 Jos. Campau, Detroit 7, Mich. Units use replaceable solid logotype, and can hand stamp around a flat radius.

Marker consists of a holder, a solid logotype bearing the desired characters, a clamping pin, and the locating guide. Locating guides are arranged for marking either from the O. D. or the I. D.

Grooved logotype is insterted into handle and held with clamping pin. Locating guide is attached to holder with screws.

Lock made by the Norwalk Lock Co., South Norwalk, Conn., showing Revere extruded brass rod from which the handle is made.

IT IS significant that in the highly-competitive building hardware trade Revere Metals are extensively used to produce fine items. Take this Norwalk Lock and latch assembly. The escutcheon plate is stamped from sheet brass, Revere Alloy No. 160, known as Cartridge Brass, 70%. This has superior ductility, and takes a high polish.

The handle is made from extruded leaded brass rod, Revere Alloy No. 280, which is widely used for hardware, forgings, and plumbing goods. This is supplied in straight mill lengths, and the manufacturer cuts it to length, bends, machines and drills each end, and threads inside and out. After polishing he has, at low fabrication cost, a handle that is strong, solid, and whose beauty will endure through the years.

In manufacture of the tumbler lock, free-cutting brass rod, Revere Alloy No. 240, is used because of the ease and speed and accuracy with which it may be worked.

The Norwalk Lock Company states: "At this time we might place ourselves on record as recommending, wherever possible, the use of brass and bronze on our products to the hardware trade in preference to other cheaper metals."

The wide range of the Revere Metals makes it possible for you to select exactly the correct ones. Revere supplies its metals in mill products as follows: *Copper and Copper Alloys:* Sheet and Plate, Roll and Strip, Rod and Bar, Tube and Pipe, Extruded Shapes, Forgings—*Aluminum Alloys:* Tube, Extruded Shapes, Forgings—*Magnesium Alloys:* Extruded Shapes, Forgings. Revere's Technical Advisory Service will gladly collaborate with you in studying these metals in their various forms, and their suitability for your product and processes.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; New Bedford, Mass.; Rome, N.Y.—Sales Offices in Principal Cities, Distributors Everywhere.

DoAll Spiral Saw-Band Design Accomplishes 360° Cutting Edge

A spiral saw band with a hard cutting edge which spirals around the band features a tooth design that gives a 360° cutting edge for cutting material in any direction without rotating the work. Made by DoAll Co., Des Plaines, Ill., special rubber-roller saw guides are said to keep the blade in alignment.

Saw can also be used for filing small radii in openings that are inaccessible with ordinary bench file or needle file equipment. Plastics and other light materials can be sawed. Spiral saws are available in two sizes: 0.040-in. dia., and 0.074-in. dia., with a 15-tooth pitch, in cut lengths or 100-ft. coils.

Cummins Portable Electric Drill Weighs about 8 Lb., Is Compact

The Model 200 portable electric ½-in. drill, weighing approximately 8 lb., is manufactured by Cummins Business Machines Corp., 4770 Ravenswood Ave., Chicago 40, Ill. Horizontal carrying handle is employed with an auxiliary side handle for two-handed operations.

Drill is powered by a Universal motor reduced by helical gears to 550 rpm. spindle speed, and will operate on 115 v., ac. or dc. A built-in fan is said to provide cool operation.

HYDRAULIC laboratory press with a 20-ton capacity is made by Hydraulic Press Mfg. Co., Mount Gilead, Ohio. Designed with double-acting ram for providing positive pullback pressure for separating molds and dies, pressing surfaces are 8 x 9 in. Maximum opening is 14 in., max. travel, 8 in., and max. pullback pressure is 2½ tons

Special Automatic Machine Assembles Washer in Piston

A special-purpose, automatic-cycle machine for assembling the packing washer onto the groove in hydraulic brake pistons is announced by Snyder Tool and Engineering Company, 3400 E. Lafayette, Detroit, Mich.

Machine embodies a continuously revolving, variable-speed table which is driven through a spur and worm gear transmission with a 2-hp. motor. Rotation speed can be changed by pick-off change gears. Two operators stationed on opposite sides of the table load pistons into the twenty automatically operated collet fixtures. Cycle is timed for completion of 50 assemblies a minute.

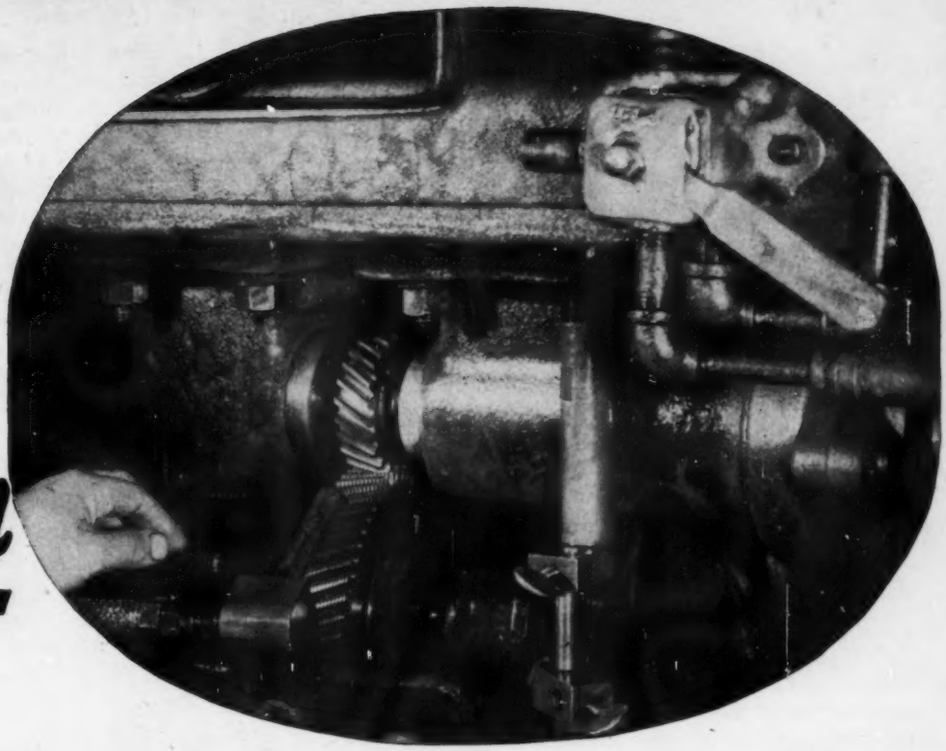
Dial Snap Gages by Cavalier For Turning, Bench Inspection

The Cavalier Gage Co., Poughkeepsie, N. Y., introduces a series of sixteen dial snap gages for turning, grinding, bench inspection, and other purposes involving cylindrical checking. Models cover a range in capacities of 8 in., in increments of ½ in. A Pistol-Grip handle is employed on all models. Indicator is positioned above the handle on models ranging from 0- to 5-in. capacity and below the handle on models ranging from 5- to 8-in. capacity.

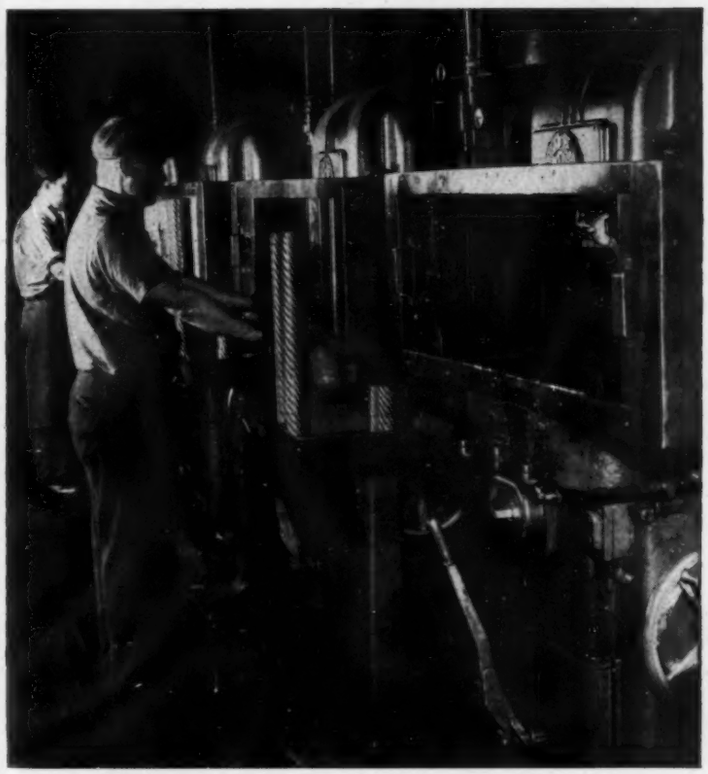
Cunningham's Marking Holder Offered in Varied Slot Sizes

M. E. Cunningham Co., 95 E. Carson St., Pittsburgh, Pa., offers the Utility marking holder, available in a wide range of slot size, for making tags, keys, steel bars, and similar material. Sizes range from ¼ in. in increments of ⅛ in. up to 2 in. slots. Nine sizes of type characters from 1/32 through ¼ in. can be used in the same holder.

News for the gear producer



Even faster GEAR SHAVING with LESS operator EFFORT



Two operators easily shave 3368 gears in 8 hours on these four Michigan "Underpass" machines equipped with semi-automatic loading.

Shaving of gears for accuracy and quietness is now so inexpensive and fast an operation on the new Michigan 870 machines that the only practical way to cut time and cost still further, is to cut the effort on the part of the operator.

This has been achieved by the provision of semi-automatic loading, now available on all Michigan Gear Finishing Machines.

In one plant, this development on a MICHIGAN "Underpass" finisher has increased production of timing gears from 920 per operator in 8 hours to 1684 ! !

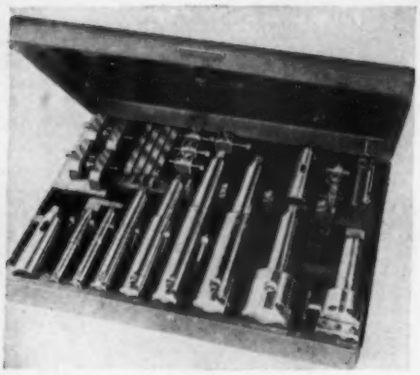
And the gears are "curved-shaved" (crowned) too, at the same time.

For the story on this, ask for "Information Sheet No. 101-1113."

ORIGINATORS of GEAR SHAVING

MICHIGAN TOOL COMPANY

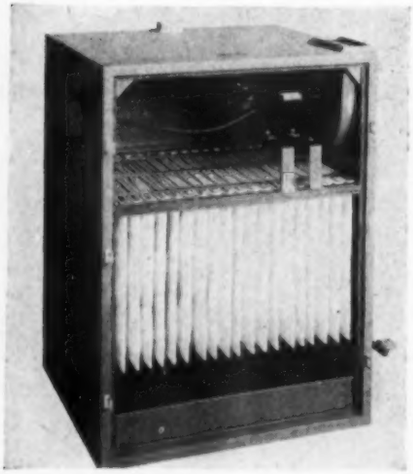
7171 E. McNICHOLS ROAD DETROIT 12, U. S. A.



Davis Combination Tool Set Includes Fly Cutter Tools

Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., introduces a combination tool set including various sizes of micrometer fly-cutter tools, an offset boring and facing head, jacks, parallels and adaptors. Set includes seven different sized boring tools having an infinite cutting range in diameters from 1¼ to 7 in.

For boring larger and smaller holes, a micrometer graduated boring and facing head with a working range from 0 to 13 in. is incorporated. Head is equipped with different type cutters which can be mounted in the tool slide either parallel to or at right angles to the tool slide.



Torit Dust Collector No. 68 Offers 4 to 1 Filter Velocity

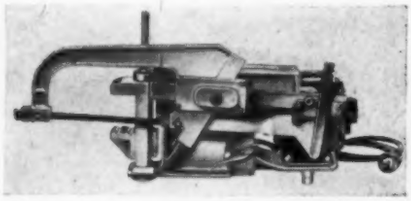
Torit Mfg. Co., Saint Paul 2, Minn., announces the No. 68 dust collector providing a 4 to 1 filter velocity (4 cfm. through each square foot of filter cloth). Twenty filters are used, each measuring 18 x 16 in. Unit develops 320 cfm., air velocity 6700 fpm., static pressure 4 in., through one 3-in. inlet. Filters are said not to bunch together under pressure. Each is filled with copper mesh wire, to prevent collapsing.

Cabinet measures 29½ x 40 x 26 in. Dust pan is 3 in. deep and provides 1970 cu. in. dust storage capacity.

Paragon Self-Aligning Sub-Press Eliminates Complicated Setups

A line of sub-presses for use with kick, arbor, air or punch presses called the Paragon self-aligning sub-press is marketed by Paragon Metal Products, 844 W. Adams St., Chicago 7, Ill. Press is said to increase productivity by eliminating the need for complicated setups for staking, piercing, bending, numbering, forming, and assembling operations on small parts.

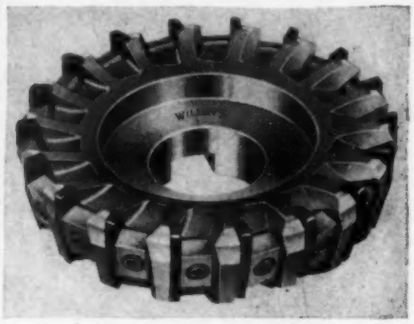
Perfect alignment is claimed as the ram and die holes are line bored to precise tolerances, a feature said involved in the personnel program as a whole, is essential to the success of that program.



Portable Power Hand-i-Hack Saw Cuts Tough, Thin-Wall Material

A light-weight portable power hacksawing machine for operation from any 110 v., ac. outlet, is introduced by Lipe-Rollway Corp., Syracuse, N. Y. Called the Hand-i-hack, it is designed to do jobs usually done manually with a hand hack saw frame.

Action design eliminates the use of weight and is adjustable for cutting in a range from solid tough materials to thin-wall tubing. Vise capacity is 3 x 3 in., and will hold 2½-in. iron pipe. Vise is swivel mounted and calibrated for cutting accurate miters. Sawing can be accomplished in any position.



Axial Face Mill for Cast Iron For Straight Facing, Rough Cuts

Mich., announces an axial face mill for cast iron designed to handle straight facing and heavy roughing cuts. Mill can also be used for finish milling and in many cases the operations can be combined.

Blades are of solid carbide ground on three sides. A large number of blades is said to provide wide distribution of work and an increase in rate of feed. Face mills are offered in six sizes, cutter diameters ranging from 4¼ to 14 in., having from 8 to 28 blades. Mills are available with both WI and WN mountings.

Allied Single-Pole Type As Relay Available for Both ac. and dc.

A small, light, medium-power, single-pole Type AS relay is marketed by Allied Control Co., Inc., 2 East End Ave., New York 21, N. Y. Unit is 1⅝ in. long, 1 13/16 in. high and 15/16 in. wide, and weighs 50 grams.

With a power rating of 1 watt, relay is available for both ac. and dc. Contact arrangements include normally closed, normally open or double throw. Its contact rating is 5 amp. at 24 v., dc., or 110 v., ac.

CORRECTION

In the latest Shop Equipment News Section (A. M., April 8), illustrations of the Bardons and Oliver No. 35 Hydralectric cutting-off machine and the Hevi Duty Electric Temperite furnace (pages 147 and 150) were accidentally interchanged.

Arc Welding Reduces Warpage ...Saves 50%

BY RAY R. FORSEILLE, VICE PRESIDENT
BALTIMORE AIRCOIL CO., INC.
BALTIMORE, MD.

THE evaporative condensers built in our plant are used in commercial refrigeration and air conditioning systems.

A number of these units, shown in Fig. 1, are ready for shipment to cold storage locker plants. The condenser coil assembly consists of a header plate and tubes. The steel tubes must be welded to the header plate with a pressure type weld capable of withstanding tests of 300 lbs. per square inch of air pressure under water.

The method formerly used to join the condenser tubes to the header plates caused excessive distortion. Converting to arc welding has minimized the warpage well within the limits allowed for the assembly and has netted savings of 50% in this one operation alone.

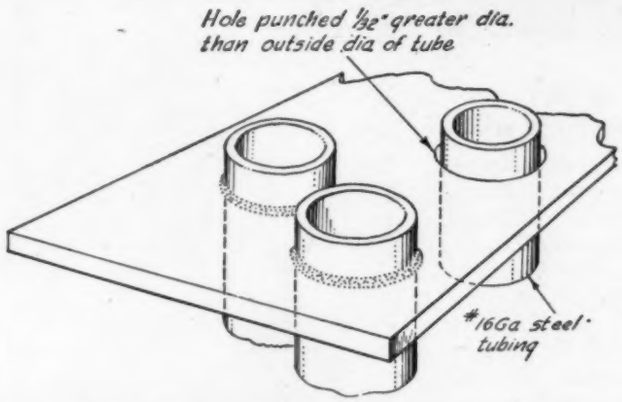


Fig. 2. Pressure weld detail of tubes to header plate.

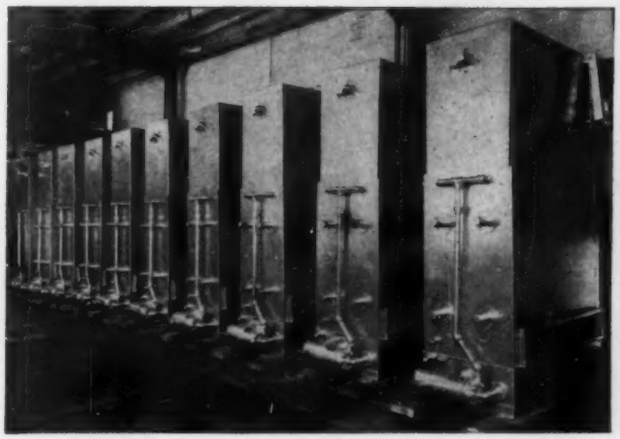


Fig. 1. Ten evaporative condensers representing 400 tube welds.

The holes in the 3/16" thick header plate (Fig. 2) are punched out 1/32" larger than the 1" diameter of the steel condenser tubes, providing a small gap to facilitate getting deeper welding penetration. Arc welding in one pass with 3/32" Lincoln "Planeweld 2" electrode produces a smooth solid weld that enables the assemblies to pass the rigid pressure tests against gas leaks with less than one per cent rejection. "Planeweld 2" has been found exceptionally adaptable for welding the thin wall tubing to the relatively thick metal of the header plate.

The header sub-assemly is built up from fabricated component parts as shown in Fig. 4. Four-inch pipe is flame cut longitudinally to form the header pipe dome to which are welded the end plugs and connector pipes. The sub-assembly is then welded to the header plate with a single pass weld, capable of withstanding the 300-lb. air pressure test.

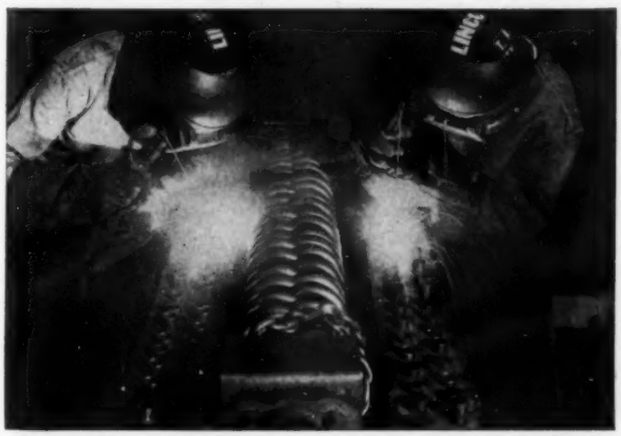


Fig. 3. Arc welding condenser tubes to header plates with single pass welds.

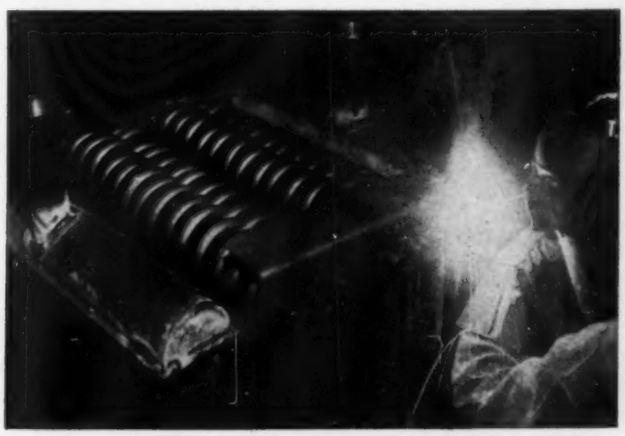
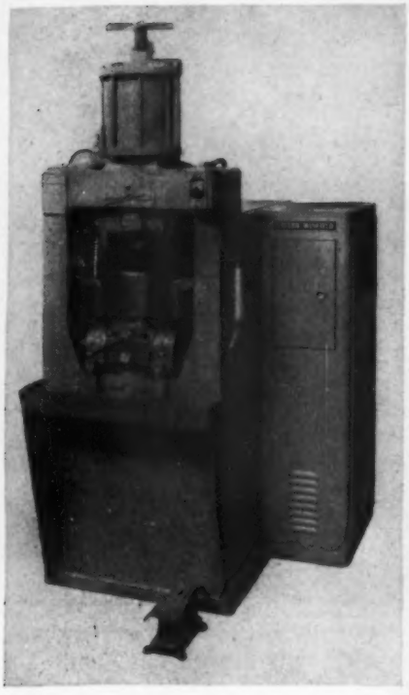


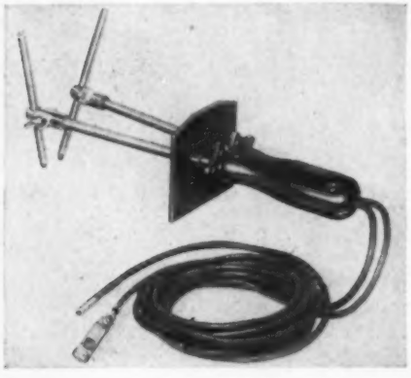
Fig. 4. Welding header sub-assembly to header plate.

The above is published by LINCOLN ELECTRIC in the interests of progress. For help in design or welding procedure, call the Lincoln Engineer nearby or write The Lincoln Electric Company, Dept. 34, Cleveland 1, Ohio.



Air-Operated Press Welder For Annular Projection Welds

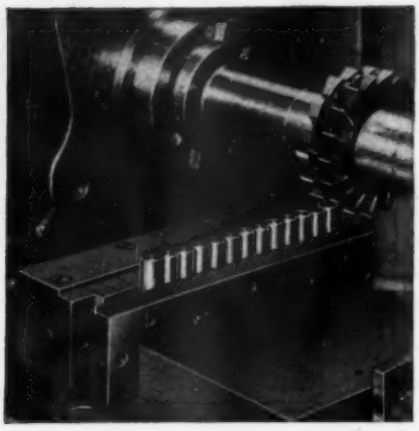
Taylor-Winfield Corp., Warren, Ohio, announces an air-operated press welder designed for annular projection welds requiring equal distribution of current around the weld and equalized welding force over the weld area. Welder is rated at 150 kva., which delivers 58,000 amp. with the low power demand of 348 kva. at 61% power factor while projection welding electrical terminals to refrigerator-motor housing cases. Box-type frame design is said to minimize deflection, assuring equalized welding force over weld area.



Carbon Arc Torch by Lincoln Heats Without Melting Work

A carbon arc torch for use with ac. welding machines is offered by The Lincoln Electric Co., Cleveland 1, Ohio. Torch is applicable where heat is desired without melting the metal being worked.

A high-temperature flame is produced between two copper-coated adjustable carbon electrodes clamped in aluminum-alloy jaws. Jaws will hold either a 5/16 or ⅜-in. dia. carbon without adapters. Torch can be used for brazing and soldering work as well as hard surfacing of thin materials.



Equalizing Gang Vise by Dery Holds Pieces Varying in Size

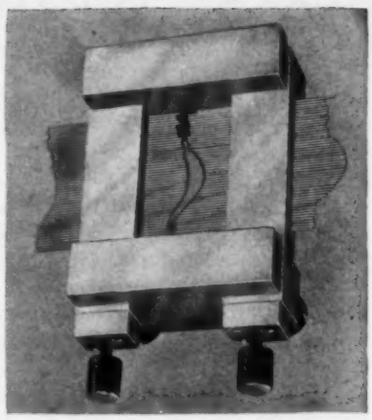
An equalizing gang vise consisting of a solid jaw and a body for holding a series of equalizing pads or blades is marketed by Dery Tool and Die Co., Pine Meadow, Conn. The V-grooves and equalizing pad form a three-point chuck for each piece of work. Pieces with a diameter variance can be milled simultaneously since blades will equalize, allowing piece to be held firmly.

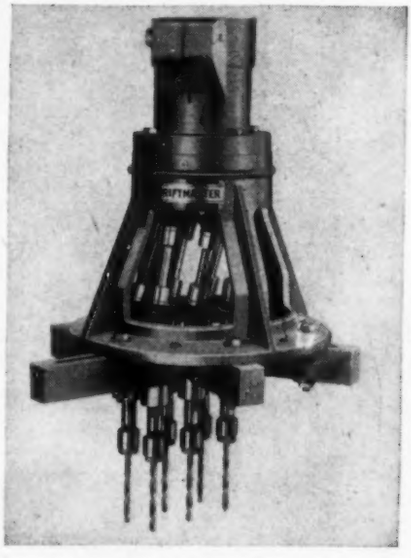
For pieces shorter than the height of the vise, a spacer is used. A steel dust cap is employed to eliminate the collection of dust and chips in the blade slots.

Thompson's Contour Transfer Gage Checks Parts, Die-Cavity Contours

A contour transfer gage for measuring any radius or contour is introduced by Accessories and Parts Div., Thompson Products, Inc., Cleveland, Ohio. Gage can be used to check die-cavity contours and production-line parts. Unit provides a means for reproducing many curves, difficult to gage directly, in a measurable form. In conjunction with an optical comparator, gage permits a rapid setup for checking dimensions.

Gage is applicable to measurement of turbine or compressor master-blade patterns and production-blade shapes, in either rough, semi-finished, or finished conditions, as well as measurement of contours of any type in die cavities, moldings, extruding and stamping dies. Pins in the gage are sized within 0.0002 in., making it possible to check contours directly on the comparator by using opposite end of the pins.

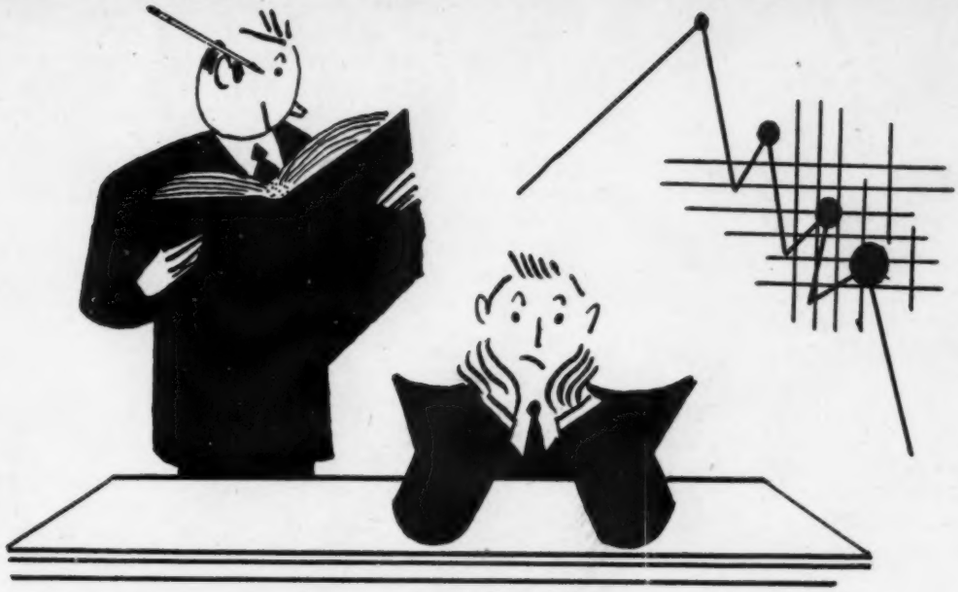




Universal Joint-Drive Drillhead Features High Overload Capacity

A universal joint-drive drillhead is offered by Thriftmaster Products Corp., Lancaster, Pa. Full ball-bearing mounted, it features a high overload capacity, and is made for use with power feed. Unit is furnished with 2 to 6 spindles, with a minimum of 1⅛-in. center spacing within a 6¼-in. dia. circle, and is made for right-hand rotation of the drillpress.

The Thriftmaster drillhead is rated at a full capacity of ¼-in. drills in steel.



The *"Purchase Price"* of your old planer may be written off your books.

But the *"Operating Cost"* is undoubtedly increasing year by year.

THIS IS DUE TO THE FOLLOWING FACTS:

1st High labor costs severely penalize the manufacturer using old slow speed machines. Modern high speed planers frequently cut planing time in half.

2nd Set up time is materially reduced due to the convenience of modern rapid traverse, tool point control, inching, etc.

3rd The work produced on a new machine is much more accurate and so saves expensive subsequent corrective operations such as grinding, filing, and scraping.

The G.A. **GRAY** *Company*

planers • milling planers
planer type milling machines
horizontal boring machines

CINCINNATI 7, OHIO, U. S. A.
SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. • SOLD IN LATIN AMERICA BY MACHINE AFFILIATES

Portable Power Belt Conveyor Applicable as Stacker, Booster

Rapids-Standard Co., Inc., Grand Rapids 2, Mich., has developed the Stevedore, Jr., for applications as a portable stacker, booster in a gravity conveyor line, or as a horizontal belt conveyor.

Unit is available in lengths of 11, 13½ and 16 ft., with either 10- or 16-in. wide belt. Length of unit can be extended within the limits of the application by addition of standardized frame lengths and lengthening of the belt. Conveyor can be used either in a horizontal position or elevated at either end.

Screw Slotters by Waterbury Built in Four Standard Sizes

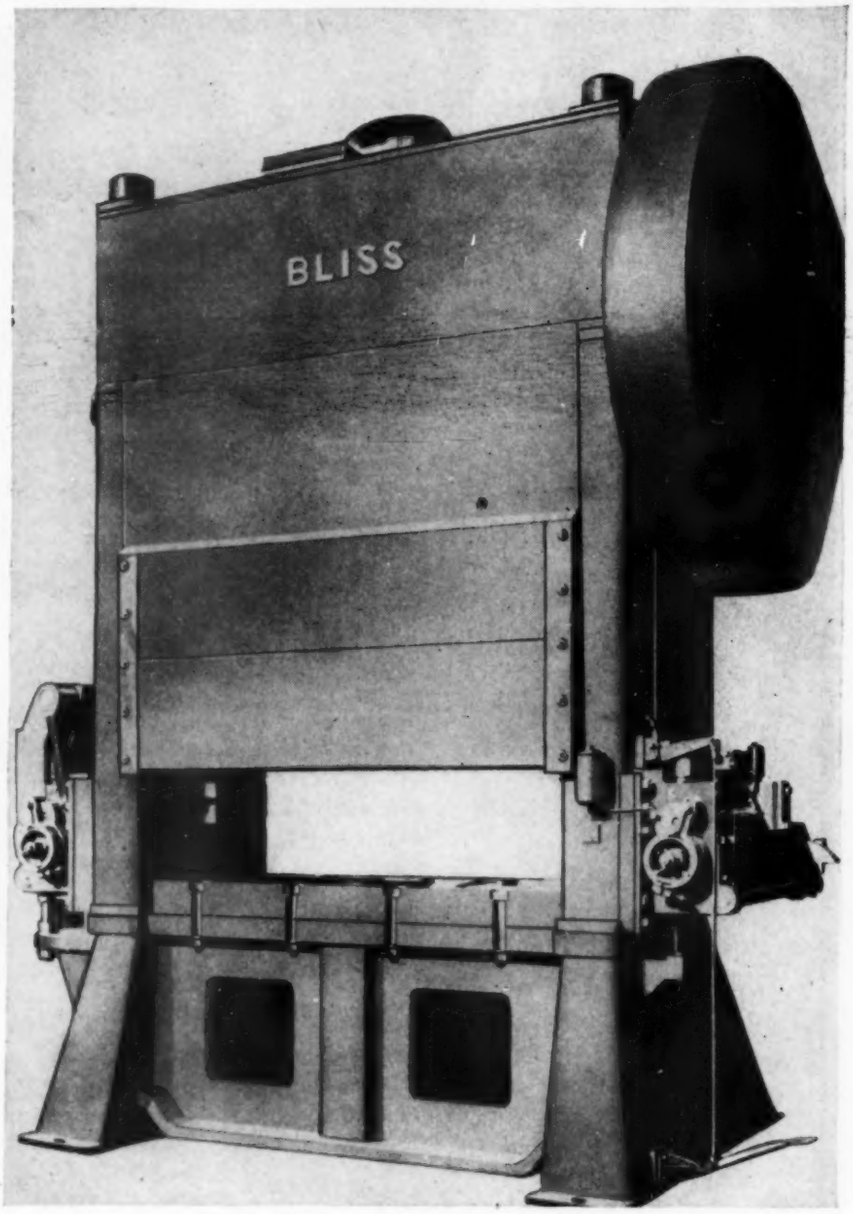
Screw slotters built in four standard sizes with capacities for machine screw sizes from No. 2 to ½ in. dia., are offered by The Waterbury Farrel Foundry & Machine Co., Waterbury 86, Conn. Machines No. 0 and 1 are built with improved hopper feed, twin-cutter burr remover, and infinitely variable production speeds. The No. 0 machine has a production rate of from 40 to 125 screws per minute; the No. 1 is rated at 20 to 80 screws per minute.

Screws enter the feed chute from a hopper equipped with a rotor having pockets that pick up the screws and deposit them into the chute. A notched dial at the lower end of the chute receives the blanks and indexes them to a position under the saw. Change gears can be furnished to provide 17 different speeds.

Saw and work are lubricated by a cutting compound pumped from a tank in the base of the machine. Machines are pushbutton controlled.

Chicago Latrobe Masonry Drills Have Spiral Flute, Carbide Tips

Spiral-flute carbide-tipped masonry drills are introduced by Chicago Latrobe Twist Drill Works, 411 West Ontario St., Chicago 10, Ill. Spiral-flute design assists in carrying dust out of the drilled holes, especially in deep-hole drilling. Drills are available in all sizes from 3/16- to 1½-in. dia., as well as in sets packaged in a toolkit roll with plastic pockets.



300-TON press used to form floor-panel reinforcements in eight steps of a progressive die is made by E. W. Bliss Co., 450 Amsterdam Ave., Detroit, Mich. Press is largest in company's No. 600 series of high-production presses. Called No. 6290-D, it is completely automatic with double roll feed and scrap shear synchronized for feeding and trimming predetermined lengths. Press has 30 to 45 strokes per min., and a die space from bed of 23½ in.

Aluminum

YOUR ANSWER TO CAST IRON SHORTAGES

If you're having trouble with 1948 ferrous casting deliveries, consider the remarkable advantages of aluminum. Delivery is fast, ultimate cost is low, and *now*, with two remarkable new alloys, Acme offers you the *highest combination of tensile strength, impact resistance, and elongation available today in aluminum castings.*

Now you can change from cast and malleable iron to aluminum with no sacrifice in strength.

Acme has the facilities, the technicians and the know how to aid you in your 1948 requirements—from blueprint to finished product.

Specify any aluminum, brass, or bronze alloy or consult our engineers.

Send Blueprints—Prompt Estimates

SAND • PLASTER
PERMANENT MOLD

NOW Super Hi-Strength ALUMINUM CASTINGS

Acme Almag 55

The highest combination of strength, ductility, and impact resistance of any aluminum casting alloy. Free machining, beautiful finish.

	MIN.	TYPICAL
Tensile strength, psi	50,000	55,000-60,000
Yield strength, psi	28,000	32,000-35,000
Elongation, 2"	16%	20%-30%

Acme Almag 35

The highest combination of strength, ductility, and impact resistance of any "as cast" aluminum casting alloy. Of special interest where heat-treatment is too costly or unobtainable.

	MIN.	TYPICAL
Tensile strength, psi	33,000	38,000-41,000
Yield strength, psi	16,000	18,000-21,000
Elongation, 2"	9%	10%-15%

ACME SERVICES: Aluminum, brass, bronze castings—patterns—tools—engineering.

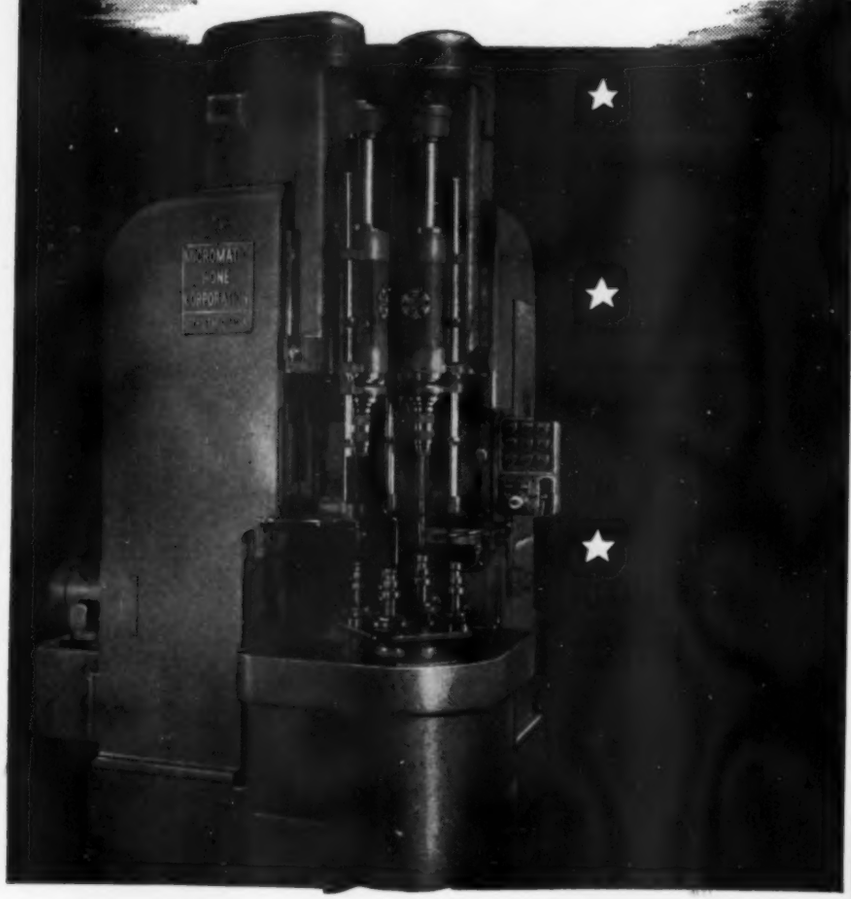
TRIPLE A

CASTINGS BY Acme

ACME ALUMINUM ALLOYS, INC.

299 NORTH FINDLAY STREET, DAYTON 3, OHIO • OFFICES IN PRINCIPAL CITIES

MEMO
Let's look into this
NEW
machine
for heavy-duty multiple
or progressive
MICROHONING



Micromatic now offers a new multiple spindle, unit constructed, Quill type machine with added power and control for removing more and more stock in less time from harder materials. Completely automatic, electronic control of uniform size within .0001 to .0003 inch in production.

Microhoning Machines, Tools, Fixtures and Abrasives

MICROMATIC HONE CORPORATION
8100 SCHOOLCRAFT AVENUE, DETROIT 4, MICHIGAN

DISTRICT FIELD OFFICES:
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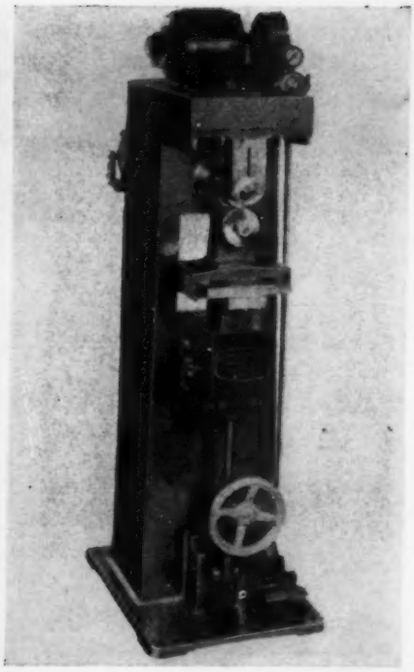
616 Empire Bldg., 206 S. Main St., Rockford, Ill.
55 George St., Brantford, Ont., Canada
Micromold Manufacturing Div., Boston Post Road, Guilford, Conn.



Graduating and Marking Machine Marks Round Parts Such As Dials

A power-operated graduating and marking machine, Model M-41, is offered by Noble & Westbrook Mfg. Co., East Hartford, Conn. Machine marks round parts such as dials for machine tools, running in sizes up to 8½-in. dia.

Machine is equipped with a pneumatic cylinder, pressure regulator, and foot control. Air pressure controls the depth of mark and by providing a uniform table pressure, compensates for variations in work, and insures a mark of even depth.

A solenoid, cutting in automatically with the table stroke, engages a clutch allowing the motor to rotate the marking die which is geared to the work through the work-holding fixture. An adjustable knee or table support for increased capacity can be raised or lowered for various diameters.

Light-Duty Metallizing Gun Offers Low Power Requirement

A light-duty low-air "L" gun offered by Metallizing Engineering Co., Inc., Long Island City 1, N. Y., requires 10 cfm. of air for metallizing. Turbine

DO YOU NEED HELP WITH A PROBLEM LIKE THIS ONE?

A COMPLICATED little job, this one! Here are the operations it involves:

Drilling holes of two sizes, turning to an outside diameter, plunge-cutting to a square shoulder, flat drilling, cutting threads and cutting off the finished part from the bar stock.

Yet one of these parts is made in a single, six-stage operation every 14.7 seconds—by one man! On an automatic screw machine, completely tooled with Carboloy Cemented Carbide, making this part from SAE 1020 steel bar stock is as easy as whittling a wooden whistle!

Sure, it's easy—*with Carboloy Cemented Carbides.* But only carbide tools could do this complex job in as little as 14.7 seconds.

Call in a Carboloy engineer

When you have a tooling problem like this one, call in a Carboloy Field Engineer to help your own engineers work it out. You'll benefit from his experience with similar carbide-tooling problems in other shops. Carboloy engineers are qualified to help you with every stage of the job.

And their assistance in determining the grades, cutting angles, depths of cut—everything about the Carboloy Cemented Carbide tools and tips you'll need to do the job best—will be of real value to you.

So whether your job calls for any of the 600 standard Carboloy tools or for special Carboloy tools available through more than 150 tool manufacturers, ask your Carboloy man to call on you. You're in for some real help—and the best in carbide tools in the world: *Carboloy.*

CARBOLOY COMPANY, INC., 11149 E. 8 Mile Street, Detroit 32, Mich.

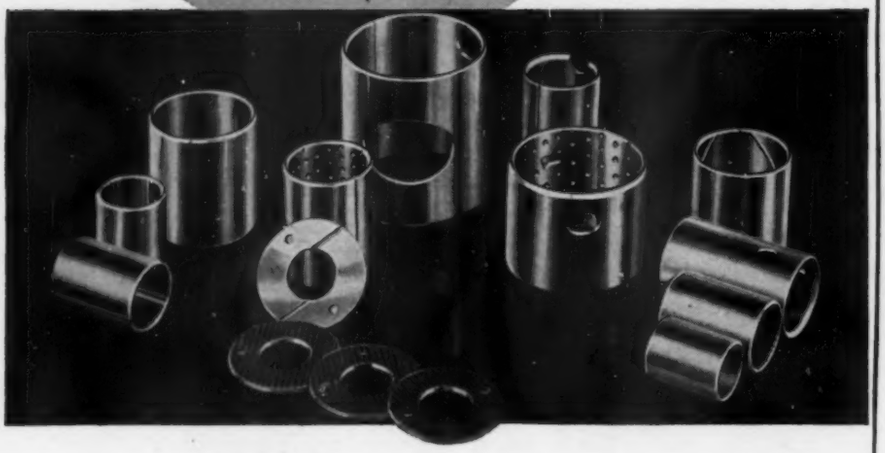
Most sizes and styles of standards are stocked by authorized distributors in 82 cities coast to coast.

AUTHORIZED CARBOLOY CEMENTED CARBIDE DISTRIBUTORS

Send for Carboloy Catalog GT-200. Keep it handy for ready reference—and savings in tool-up time and costs.

CARBOLOY® CEMENTED CARBIDE

Quick Delivery
THIN WALL
BEARINGS
by
Johnson
Bronze



● You need not experience costly delays in securing thin wall bearings and bushings. Here at Johnson Bronze, we are equipped to furnish promptly your requirements, made to your specifications . . . and within a period of days, not weeks.

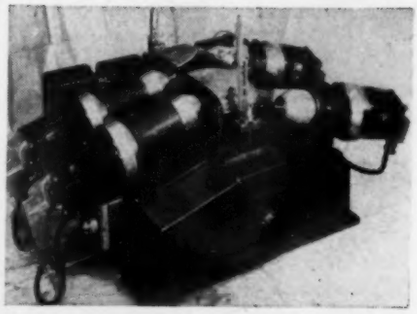
Johnson Bronze bearings assure you of top quality in materials and workmanship. We produce them in rolled sheet bronze . . . bronze on steel . . . babbitt on steel. Our facilities for manufacturing thin wall bearings are complete . . . our help is skilled . . . and our experience dates back forty years.

If we can assist you in better delivery or improved quality . . . write, wire or call today.

JOHNSON BRONZE COMPANY
515 S. Mill St. New Castle, Pa.

construction offers low power requirement, making a large compressor unnecessary. Nozzle construction is said to assure low consumption of acetylene and oxygen. Turbine control requires only one adjustment for entire range of metallizing wires.

TRANSPORTER, the Automatic Dual Lift, is offered by Automatic Transportation Co., 149 W. 87th St., Chicago 20, Ill. Foot pump reduces foot pressure necessary to lift loads into moving position or maximum height. Release of pedal pressure opens valve that permit a high-speed cylinder to idle while the high-pressure cylinder is lifting load. Available in both foot-lift and electric-litt models in 4000- and 6000-lb. load-capacity platform models and 3000- and 4000-lb. capacity pallet models



Simplex 4-Way Drilling Machines Drill Holes in Typewriter Covers

A 4-way drilling machine for drilling holes in typewriter covers is manufactured by The Simplex Tool Engineering Co., 2540 Park Ave., Detroit 1, Mich. The automatic high-speed unit drills four holes in the part from underneath. Forward and reverse movements of the drill spindles are automatic. Units each have a capacity for drilling holes up to 9/32 in., and can be mounted in any position desired.

80 Seconds CYCLE TIME

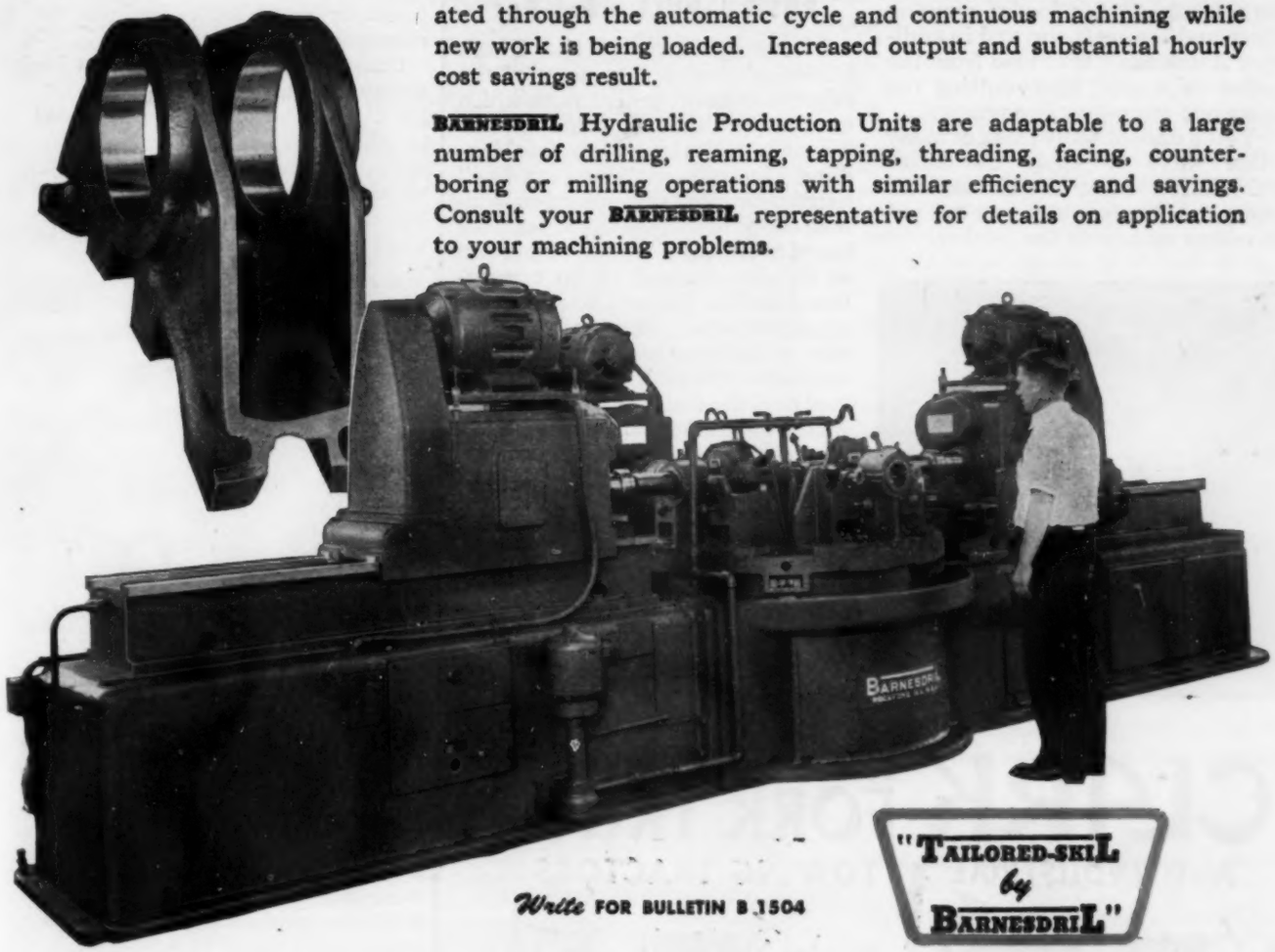
Rough, Semi-Finish, Finish Boring

on BARNESDRIL High Production Unit Type Machine

● The advantages of timed cycle control for machining parts progressively or in multiples, is demonstrated by the operations on this steel brake head. A BARNESDRIL 3-way Horizontal Unit-Type Boring Machine, equipped with 4-station automatic index table, rough, semi-finish and finish bores each piece complete in 80 seconds.

This represents an increase of double the number of pieces produced by the former method. Handling time has practically been eliminated through the automatic cycle and continuous machining while new work is being loaded. Increased output and substantial hourly cost savings result.

BARNESDRIL Hydraulic Production Units are adaptable to a large number of drilling, reaming, tapping, threading, facing, counterboring or milling operations with similar efficiency and savings. Consult your BARNESDRIL representative for details on application to your machining problems.



Write FOR BULLETIN B.1504

"TAILORED-SKIL by BARNESDRIL"

BARNES DRILL CO.

830 CHESTNUT STREET ROCKFORD, ILLINOIS U.S.A.

MATERIAL HANDLING News

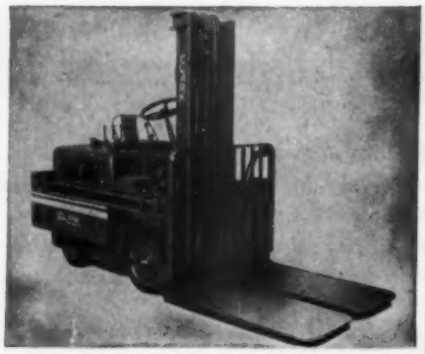
SOLVED! — that familiar problem of transferring a load of material from a pallet to a common carrier at minimum cost — as a *unit instead of one piece at a time* . . . Clark's PUSHER Device attachment for Clark fork trucks *removes the load, retains the pallet.*

Alert management in many businesses, and yours may be one, has long sought for a quick, low-cost machine-power way to transfer material from pallets to common carriers when the pallets are not to be shipped. That problem has been permanently solved by the Clark Pusher Device.

REMOVE LOAD—RETAIN PALLET

A Clark fork truck equipped with this efficient attachment will perform all the normal functions of a fork truck—lifting loads, carrying them and tiering them; and in addition it unloads a unit load from the pallet *as a unit,* short-cutting the laborious piece-by-piece removal.

You'll undoubtedly think of many other ways to apply the Clark PUSHER's basic usefulness; and every new use to which you can put it means money in the pocket.



PUSH + PULL = Pul-Pac

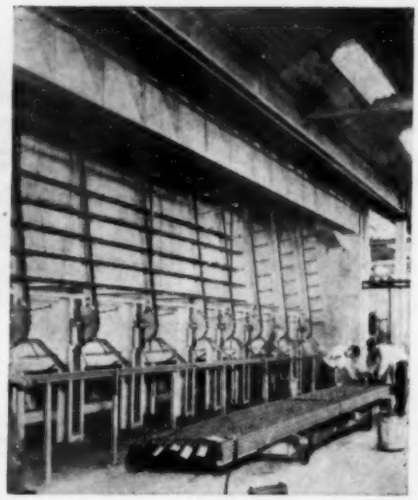
Many features of the Clark PUSHER device were born of the exhaustive development work which created the Clark "Pul-Pac," sensation of both National Materials Handling Expositions. The "Pul-Pac" handles unit loads assembled on load-base sheets of corrugated paper, fiber board or similar material, disposable or durable, instead of on conventional pallets. Its rack has a clamping device which grips the projecting edge of the load-base sheet; and retraction of the rack draws the entire load onto the truck's carrying plates. At the load's destination the pusher removes it, base-sheet and all.

FOR LOWER-COST HANDLING

Both these revolutionary advancements are today saving big sums for businesses in many fields. Let Clark help you discover rich opportunities for savings in your own operations. You'll benefit your business when you CONSULT CLARK.

CLARK ELECTRIC AND GAS POWERED **FORK TRUCKS**
AND INDUSTRIAL **TOWING TRACTORS**

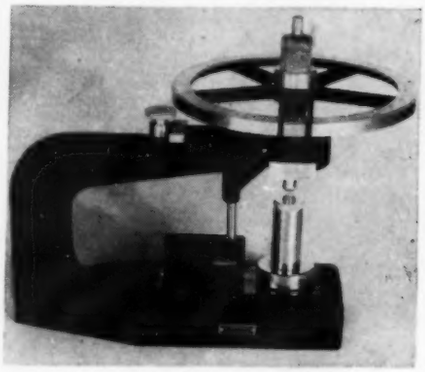
CLARK EQUIPMENT COMPANY, TRUCTRACTOR DIVISION, BATTLE CREEK 3, MICH.
REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE WORLD



Vertical-Tower Oven Conveyor Incorporates Gas-Fired Oven

Ace Conveyor Industries, Inc., Detroit, Mich., introduces the Vertical-Tower oven conveyor system which includes a Burdett equipped gas-fired oven through which the conveyor runs. Painted parts to be baked or dried are carried on the conveyor.

Conveyor is adaptable to meet individual requirements of a particular plant. The tower is constructed to give the required paint-baking cycle. Extended pins on the nine strands of the conveyor chain handle the work through all operations in the tower.



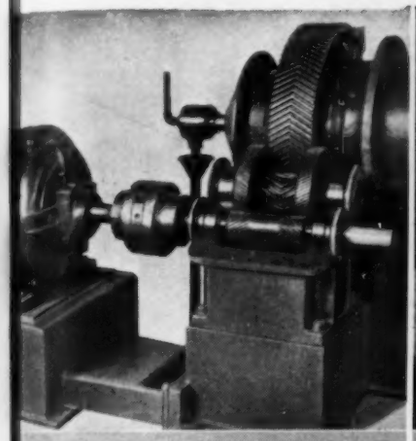
Vernier Index Read to 0.00001-in. On Portable 3-in. Micrometer

A zero to 3-in. light-wave micrometer is announced by The Van Keuren Co., 176 Waltham St., Watertown, Mass. Unit features a specially designed ½-in. dia., 40-tpi., heavy-duty precision micrometer head, an 8-in. dia. micrometer wheel with 0.0001-in. graduations, and a vernier index which reads to 0.00001 in.

Micrometer with its calibration chart showing accuracy of the screw, is a portable unit which will measure to 0.00001 in. without gage blocks or other reference standards.

Whenever you need gears—think first of

FALK GEARS



Standard Falk Speed Reducer gears, pinions and bearings give added efficiency to the operation of this tuber machine in a rubber mill.

Falk herringbone gears drive one of the largest vertical triplex pumps in the country. These gears have 24/266 teeth—3 DP—12" face.

Battery of Ball Mills in copper mine using Falk gears. These gears have been in use over 20 years—requiring no replacement.

Special Falk Right Angle Drive with external Falk single helical low speed gears to drive sand mixer. 35/143 teeth—4.46 DP—5" face.

precision-made for dependable performance

Behind the excellent reputation of FALK gears stands a 55-year record of continuous metallurgical and technical research . . . development of engineering skills which are not only **proved** but constantly **improved** . . . and special manufacturing processes which produce precision gears for long, trouble-free service.

FALK gears are employed by manufacturers and machinery users . . . for initial installation and for changes in the field . . . in factories, mills, mines, in fact wherever power is being transmitted. Many FALK gears installed more than a score of years ago are giving splendid satisfaction in service today.

We keep on hand a large selection of gear patterns to save you time and expense in ordering gears for many applications. Also, we are equipped to fill your needs for special-type gears of whatever size or design you may require. It always pays to "think **first** of FALK gears," and then consult FALK. It's more than ever "a good name in industry."

Check your needs...

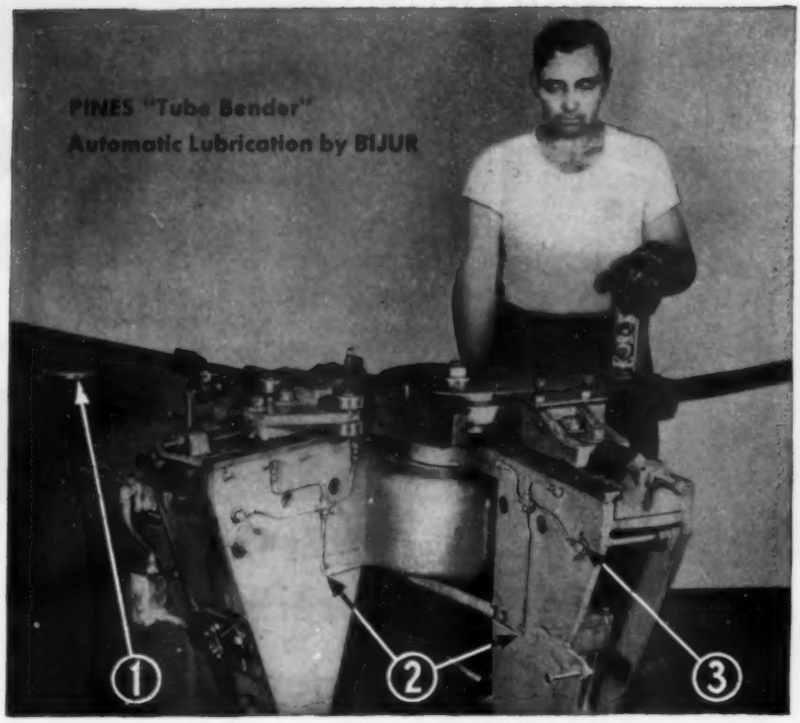
Stock gears	Herringbone gears
Heavy duty gears	Small gears
Large gears	Gears for mines and mills
Mill pinions	Ring gears
Single helical gears	Special gears

Falk makes them all!

THE FALK CORPORATION, Milwaukee 8 Wisconsin
Established 1892

Precision manufacturers of Speed Reducers . . . Flexible Couplings . . . Motoreducers . . . Herringbone and Single Helical Gears . . Heavy Gear Drives . . . Marine Turbine and Diesel Gear Drives and Clutches . . . Steel Castings . . . Contract Welding and Machine Work. District Offices, Representatives, or Distributors in principal cities.

FALK ... a good name in industry



THIS MAN DOES NOT OIL HIS MACHINE . . .

because he's too busy bending tubing into complicated shapes . . . he's too busy getting out a full day's production . . . in short, he's just too busy to bother with the details of lubrication . . .

YET THE MACHINE KEEPS RUNNING SMOOTHLY . . .

because it's a Bijur-oiled machine which oils itself *while running* . . . it assures the correct oil-film to each individual bearing *automatically* . . . it eliminates the human element from the oiling routine . . .

WHY . . .

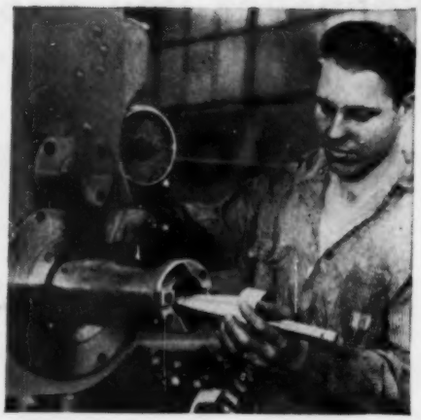
because built into the machine is a cyclic lubricator (1) which periodically discharges a measured quantity of filtered oil . . . a single line of branched tubing (2) instantly delivers the oil to the bearings . . . a meter-unit (3) at each bearing apportions the correct oil-film to the bearing surface *automatically*.

3044

For further information, write for
"The Travels of Modern Lubrication."

BIJUR LUBRICATING CORPORATION

43-01 22nd Street • Long Island City 1 • New York

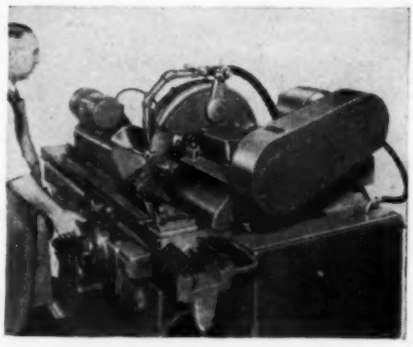


Giddings & Lewis Spindle Design Eliminates Need of Drift Keys

Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., offers a quick-change spindle with double-acting screw lock which eliminates need for draw and drift keys. Also incorporated is a fast taper socket.

Spindle improvement enables operator to rapidly mount cutting tools by inserting the shank of the cutter, arbor, adapter or boring bar into the spindle opening or socket. The double-acting screw lock composed of two segments and screw is located in a special draw slot in the machine spindle immediately behind the taper opening.

Seating or drawing in the shank is accomplished by tightening the lock's single screw which has both right- and left-hand threads. A wedging action between the lock segments and against the tapered notches cut in the adapter shank is caused by drawing the two lock parts together by means of a small T-wrench.



Brown & Sharpe Grinding Machine Manufactured with 10-in. Swing

Brown & Sharpe Mfg. Co., Providence, R. I., announces the No. 10 and 12 plain grinding machines now available with a 10-in. swing. Machines are designed for rapid cylindrical grinding of small and medium sized parts to close limits on a production basis. Machines are said to

Independent Pneumatic anchors Henry Wright Dieing Machines on

UNISORB

without Bolts or Lag Screws

Writes the Independent Pneumatic Tool Company, Aurora, Ill.: "We purchased your UNISORB *material for mounting two Henry Wright Dieing Machines we have in our plant. We are very happy to state that this material is working out very satisfactory in absorbing the shock put out by these machines operating side by side."*

This trend of modern industry to "Anchor it on UNISORB"... the *new* way that means no bolts, no screws, no damage to floors... is fast eliminating the costly floor drilling, long installation man-hours and other inefficiencies of the old method of anchoring equipment to the floor.

UNISORB pads adhere to the machine feet on one side, and to *any* type of flooring on the other... grip with phenomenal strength and permit no creeping... can be used with practically every type of machinery and equipment... will absorb from 60% to 85% of transmitted vibration and noise.

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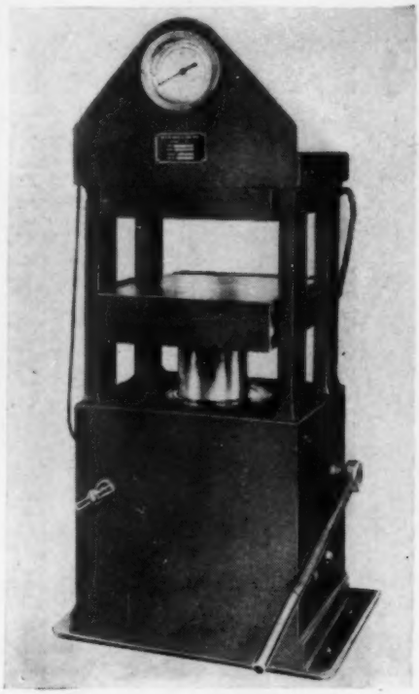

M & N 30-Ton Hot Plate Press Molds Rubber, Powdered Metal

A 30-ton hot-plate hydraulic press for plastic laminating, plastics and rubber molding, powdered metal, forming, drawing, embossing and hobbing, is introduced by M & N Machine Tool Works, Inc., 152 Orono St., Clifton, N. J.

Electrically heated thermostatically controlled platens, totally enclosed hydraulic system, and dual pressure pump are included. Base is 16x12 in., platen size, 12x12 in., daylight opening, 10 in., stroke, 6 in. max.

P & H Hard-Surfacing Electrodes Available in Four Varied Grades

A group of four hard-surfacing electrodes listed as the P & H Hartop series, is announced by Harnischfeger Corp., Milwaukee 14, Wis. Hartop Brown offers a 35 to 40 Rockwell C Hardness and is designed for welds subject to angular shock and abrasion. Hartop Green is made for high resistance to impact and abrasion and provides strong bonds on carbon and alloy steels, manganese

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Above: Wrist pin holes of aluminum alloy pistons are rough and finished precision bored on the Ex-Cell-O Automatic Piston Boring Machine shown below.

Above: Ex-Cell-O Automatic Piston Boring Machine. Chute at front delivers finished work to conveyor at rate of 200 pistons per hour net.

Ex-Cell-O Piston Boring Machines Cut Unit Costs with Fully Automatic Operation

One solution to the problem of rising labor and material costs is through the use of more automatic machinery. For instance, the Ex-Cell-O Piston Boring Machine shown to the left provides an excellent illustration of how automatic operation increases output per manhour. The pistons are fed into the machine from a chute, and after being rough and finish bored they are ejected onto a conveyor belt *at a rate of 200 pistons per hour net!* Pistons come to the machine with the wrist pin holes just as they are cast—no previous operations on them are necessary. The operator's only function is to load the work into the chute and spot check the finished parts. In many instances, one man can take care of several machines.

48-16

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steels, and cast iron. Rockwell C Hardness is 45 to 50. Hartop Red is for severe impact and abrasion and has a hardness of 50 to 55. Hartop Yellow offers a hardness of 58 to 63.

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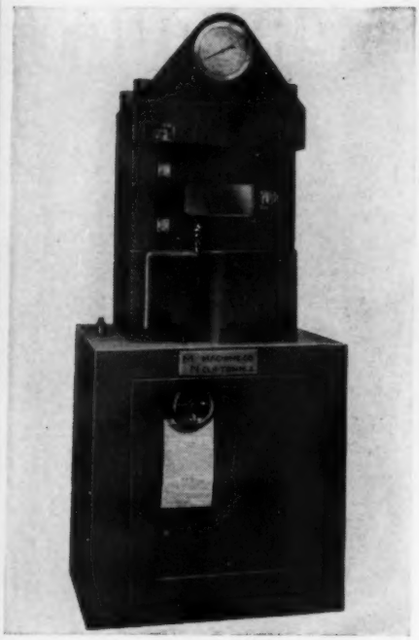

Die-Shearing Press by M & N Blanks, Forms, Embosses Dies

A die-shearing press for blanking, forming, and embossing dies is announced by M & N Machine Tool Works, Inc., Clifton, N. J. The hardened punch or male die is machined, after which the female die is roughly sawed out. The die-shearing press is then used to shear in the male punch by insertion into the female part. After filing the necessary clearance, and hardening, the dies are ready for use. Opposite procedure is necessary to construct the male punch. Press is self-contained with pump and motor in base.

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ROUND TABLE *Discussion*

VACATION—A LOAF OR A LEAVE?

The fundamental object in taking a vacation is to give a rest or change to either muscles or brains, or both. Rest from the duties which have caused the fatigue gives nature the opportunity to ease a growing tendency to irritability. It is when these signs are present that standards of work, judgment, and conduct fall and the risk of accidents is increased, whether in the workshop, in the home, or on the road. The man who does not take a vacation in these circumstances is foolish and is asking for trouble.

It was said once by a famous politician that true recreation was a change of occupation. This can be true, but the change must be real. The man who said this was a parliamentarian and his recreation was that of felling trees; to use muscle instead of brain. This was a complete change.

Thompson could have had a change of environment, but this could have been more harassing than his regular job. Fishing or sunbathing might have been better, or he might with advantage have emulated the old Scottish ferryman who, when asked what he did when his ferry was not in demand, said, "Sometimes I sits and I thinks, and sometimes I just sits."

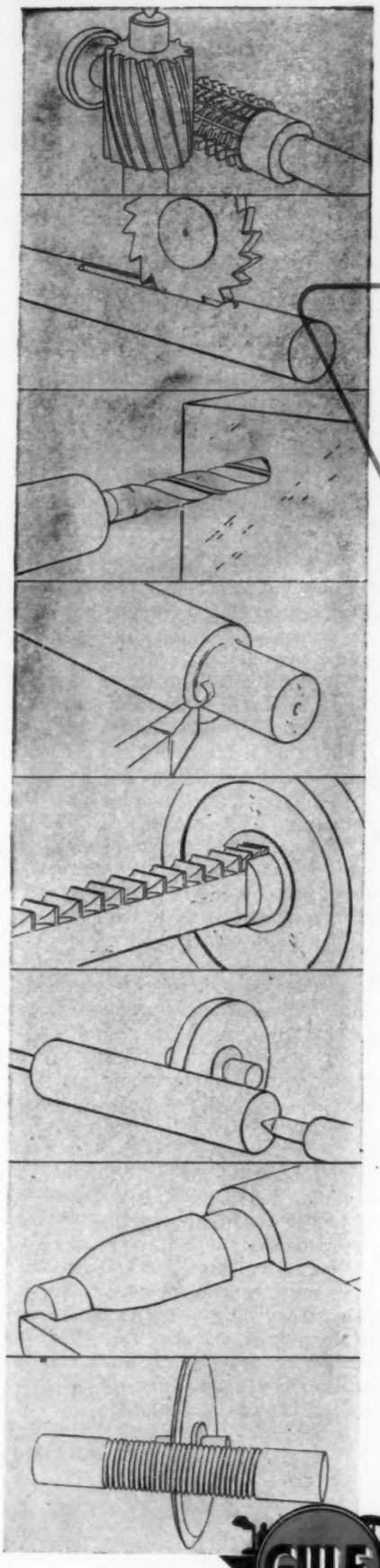
J. E. Powell
Cambridge, England

●

TROUBLE SHOOTER OR TROUBLE MAKER?

Naturally, foremen do not always understand the principles involved in management, since many companies do not adequately train their foremen in this respect. Management will complain to the foreman when something is done wrong, and flood him with literature, but actually train him —*no!*

It is little wonder that Ed feels that he must tell each of his boys how to do a job. It makes him feel important, and he can show his authority and demonstrate the importance of his position. But Ed won't last long. He will lose all his old friends, management will hear how high-handed he is, and will take steps to remove him. Thus, he will become another victim of the non-



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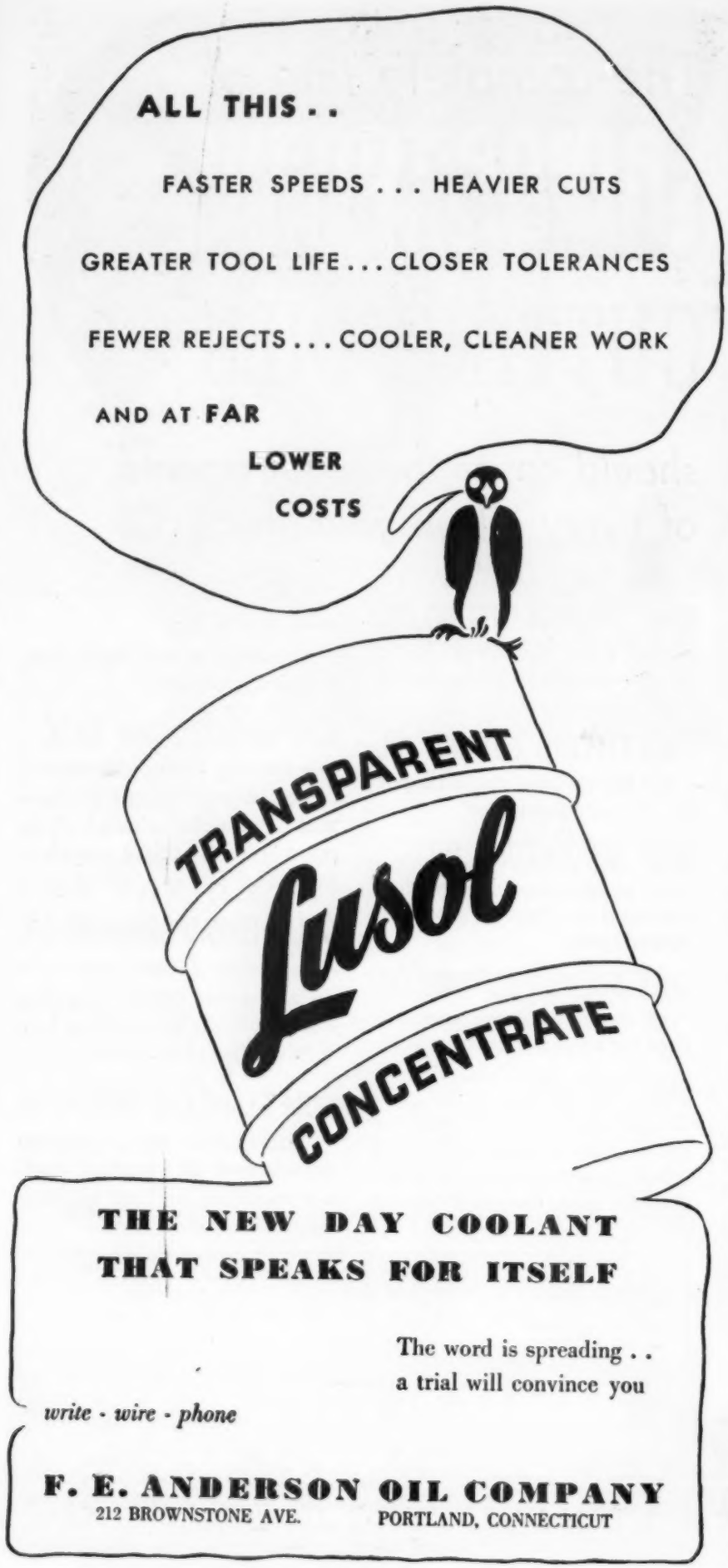
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training of employees by a company. This is regrettable, since a good foreman is not found in every employee.

Every foreman has the chance to outline a job. He can talk over the work with the man who is to perform the operation, outlining the tolerances required, the type of finish needed, and any other special instructions.

Actually, how the employee accomplishes the task shouldn't bother the foreman as long as his men are competent workers and skilled. It is true that each worker will have his own procedure in getting work done. The only real reason a foreman should instruct a man on a job is if the man's technique is such that he requires a longer period of time to accomplish the same results as other men doing the same job.

Most workers realize that some instructions is necessary when a new job is presented to them, but they do object—and rightfully—to being told every detail.

Practically all skilled men have pride in their work and in their knowledge of how to do the job well. This pride should be encouraged and properly guided in order to build a better worker for the company. This is the responsibility of the foreman. He must train his workers to a point where some of them are capable of becoming foreman material.

The fault of telling men how to do the job is not confined to foremen. Many supervisory personnel in highter capacities, because of lack of training, do the same thing. They believe that the only way to impress those under their jurisdiction is by being super-important. They frequently tell a man how to do a job, when they do not know how to do the job as efficiently as the man to whom they are talking. This serves to antagonize workers and causes the boss to be laughed at.

Therefore, Ed, and others like him, must become bigger than their jobs. They must learn to be leaders of men—not drivers. It is well to remember that better work can be attained by a few kind words than by the use of the slave whip.

Charles D. Townsend
Centralia, Mo.

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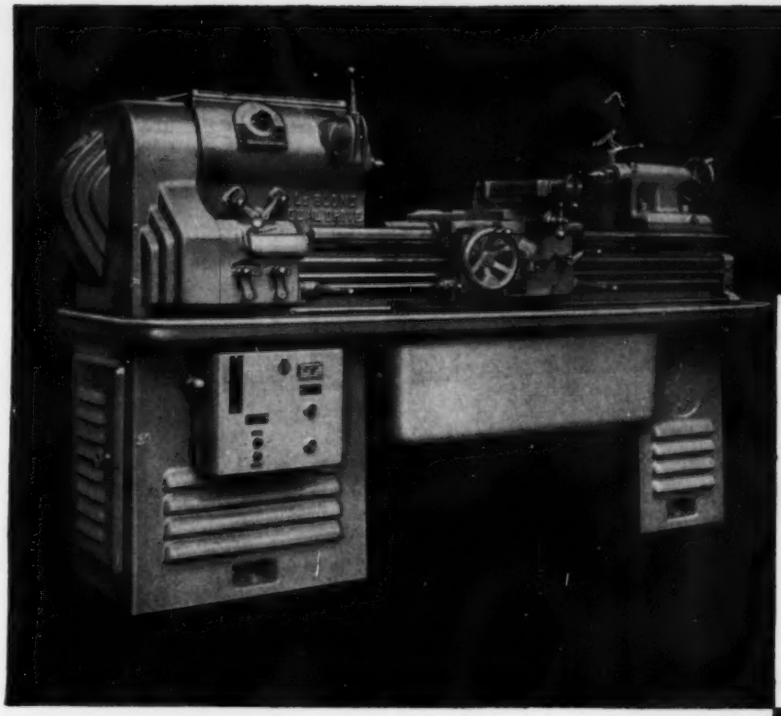
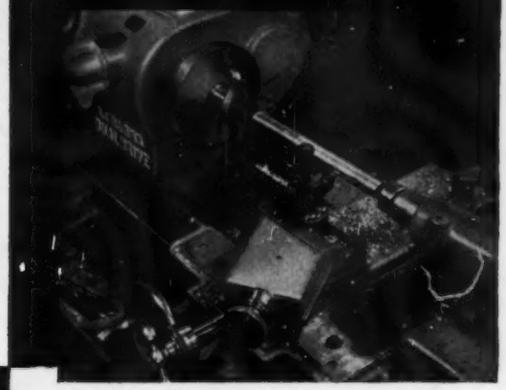
GUARDS OR PRODUCTION?

When accidents go up, production goes down. It takes time to break a man in on a machine. On a shaper, or any other machine, guards are necessary. Sometimes safety is over-





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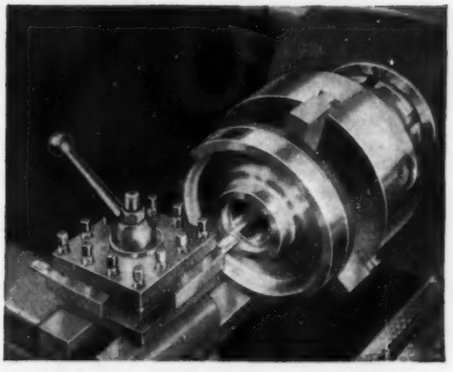

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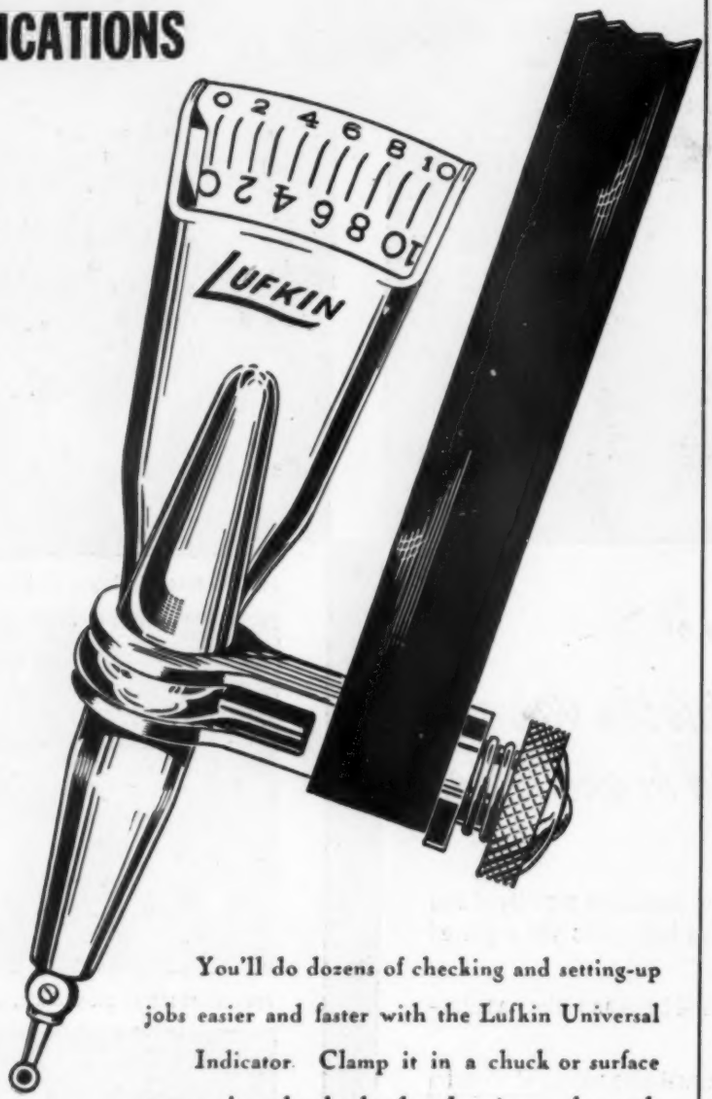

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done; some safety engineers are creating protection gadgets that are an interference more than a protection.

Many oldtimers are against safety devices because they think that some "smart Alec" is trying to show them how to do their job. They resent someone showing them how to be safe, and their thoughts run something like this:

"I have been on the same machine for the last 20 or 30 years; I can operate the machine with my eyes closed, and now they want to protect me. Why? If it was good for the last 20 years, why is it not now?"

If Ed knows his men, and should himself be safety minded, he can easily show his men that safety devices are for protection, pointing out the accident that happened to John and Bill, fellow workers, and the loss of time which resulted. Collections were taken up for them among fellow workers, and the men against safety devices probably contributed. Then the men working on the machines will not only stop resisting, but will look for gadgets to prevent accidents.

Many a man who is a good machinist, knows his machine throughout, is safety minded, and has a good safety record, can be the victim of an accident which is beyond his control, pointing up the fact that precautions are necessary.

Michael Axler
New York, N. Y.

•

Al is right. In the long run, safety is more important and more economical than a high production volume.

During the past few years, production has reached its highest peak while deaths and injuries on the job have declined enormously, as a result of enforced safety programs. Long ago when I worked in the steel industry there were always a half dozen or so employees in the emergency room suffering from serious injuries of one kind or another. Today, you only see that condition occasionally in the shops because adequate safety guards have been installed.

Ed complains that guards on machines are a hindrance which slow down production and prevent maximum output. He feels that his men know enough about their machines to take care of themselves without a lot of guards being placed on the machines. Al, on the other hand, feels that the guards keep the men on the job and out of the first-aid room.

I have seen some guards that were

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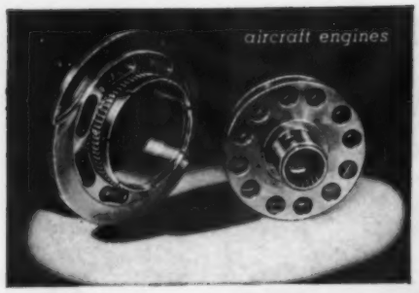

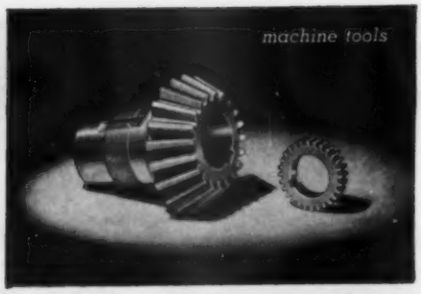

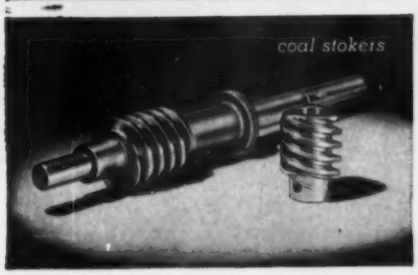

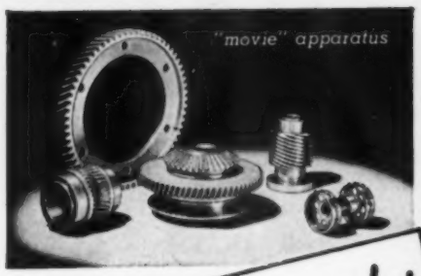

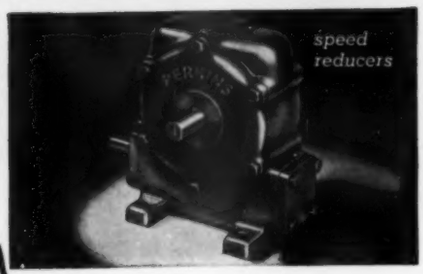

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a hindrance to production, and agree this far with Al. But the solution to this problem would not be to remove them, but rather to redesign them to render them less interfering to operations, without taking away the protection they offer. I am under the impression that if safety guards were designed by engineers who plan machines this could be done. Accidents happen to the competent as well as the incompetent operator, so guards cannot be completely taken away.

I agree with Al that the safety man in a shop is not trying to tie up output with unnecessary guards. Rather he is concerned with the well being of the men in safeguarding them from accident and must have the cooperation and support of the production supervisor. If there is a quarrel between the two on the matter of guards vs. production then they should get together to see what can be done to work things out to their mutual satisfaction with production unhampered on the one hand and the men adequately safeguarded on the other.

Summing things up, I feel that no matter how experienced a man is on a machine or how long he has worked at it, he still needs protection against accidents. It only takes one slip to injure a man for life. Be careful today so that you may live to be careful tomorrow, is my advice.

Arthur Silvester
Niantic, Conn.

•

DOES A RAISE RAISE OUTPUT? A raise in wages does not necessarily increase output. The relations between employers and employees in the large plant, where absentee ownership is the case, and in the small shop, owned by one or two men, who personally know the greater part of their crew of operators and foremen, vary widely.

In the large organization, the officers, directors, and stockholders know none of their shop workers, but they are all looking for returns on their investments. However, in the large plant the equipment is usually first-class and the operator is required to take advantage of this fact, so, unless he can figure out some short cut, he may be up against it, for he may be shoving a machine to its limit; hence in this case a raise in wages may mean simply a case of increased cost per unit of product to the firm.

In a jobbing shop, good mechanics are necessary and these men are often the best in morale and efficiency. They work hard, are opti-

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UNIFORMS
The industrial uniforms illustrated were sketched from the Helen Cookman designs shown recently by Reeves Brothers at the St. Regis Roof in New York City.

AN ACCELERATED interest is being shown by many industries in the uniforming of their employees. Safety, comfort, efficiency, economy, employee morale and public good will are the factors being given careful consideration in the development of these industrial garments.

Reeves Brothers, through its textile and garment design research and by virtue of wide experience gained during World War II, is in a pre-eminent position to help in the selection of high quality cotton fabrics.

Woven from high grade cottons, Sanforized Shrunk* and vat dyed in a wide variety of appealing colors, the Reeves Fabric Group offers a wide range to choose from. Each fabric has been developed with an eye to its fitness for the purpose for which it is intended. Whatever your problems, call or write us for information concerning fabrics for industrial uniforms, utility and work clothing.

**Residual shrinkage less than 1%.*

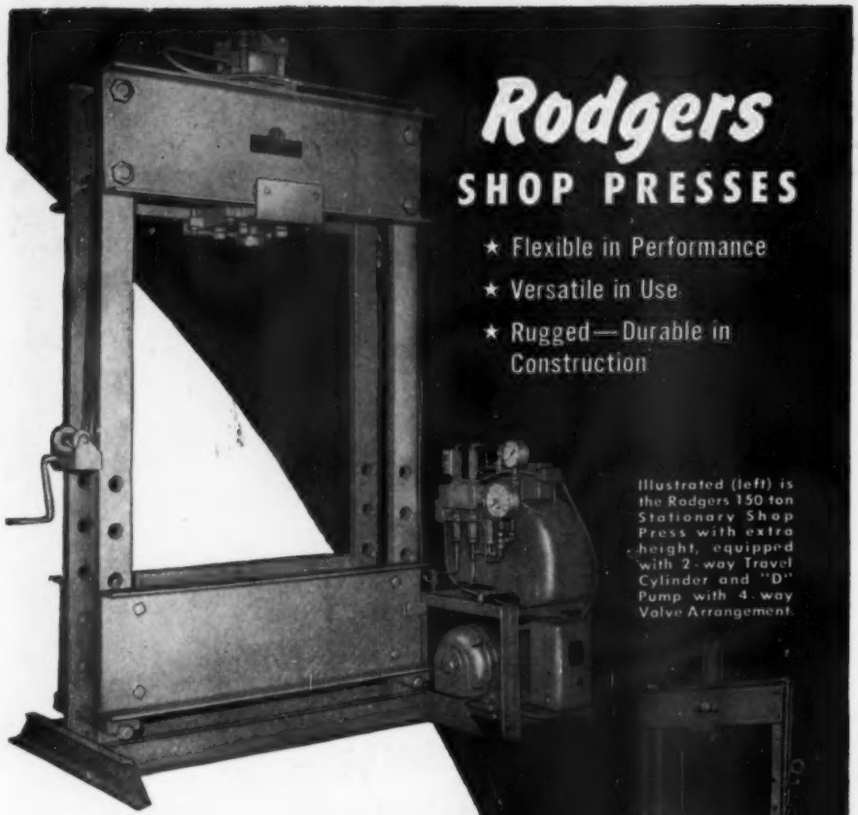
"FROM COTTON TO CUTTER"

THE REEVES FABRIC GROUP INCLUDES: Reeves Army Twill • Reeveking Gabardine • Glengarrie Poplin Marine Herringbone • Byrd Cloth • Warrior Twill Mountain Cloth • Pima King Broadcloth Reevecord • Parklyn Pique

MADE OF FINE COTTONS

REEVES BROTHERS, INC. • 54 WORTH STREET, NEW YORK 13, N. Y.

REPRESENTATIVES IN: *Akron • Atlanta • Boston • Chicago • Dallas • Los Angeles • Philadelphia • Portland, Oregon • St. Louis • Montreal • Toronto*



Rodgers
SHOP PRESSES

★ Flexible in Performance
★ Versatile in Use
★ Rugged—Durable in Construction

Illustrated (left) is the Rodgers 150 ton Stationary Shop Press with extra height, equipped with 2-way Travel Cylinder and "D" Pump with 4-way Valve Arrangement.

The Rodgers "Sixty"—60 ton Shop Press (shown above) takes care of those miscellaneous jobs that waste so much time and labor. Available with hand operated pumps, or with gear head motor drive, also powered with "D" pump power unit.

Rodgers 100-ton Stationary Shop Press powered with 4-Speed Hand Operated Hydraulic Pump, also available with "D" pump power unit. Please note that on all presses the cylinder is movable across the entire width of press.

For tough service and maintenance work in pressing, squeezing and forcing, there is a Rodgers Press to meet your requirements. These rugged, flexible shop presses are available in 60, 100, 150 and 200 ton sizes. (300 and 400 ton capacity presses are available upon special order). They all embody the same proved Rodgers design and performance features: Bolster of press is raised and lowered by a hand crank . . . special alloy steel pins can be adjusted to allow desired opening . . . cylinders may be had with one way travel or two way travel in ram travel lengths from 6" to 14" as desired—frame construction is of strong, durable rolled steel plate. Power is supplied by self-lubricating hand pumps or power driven pumps.

Save time and labor on your jobs with a Rodgers Shop Press—the exact model that is best suited for your needs. You'll get prompt delivery on any standard model press.

✻ *Send for this catalog giving complete descriptions, illustrations and specifications of Rodgers Shop Presses. There's no obligation. Write today for your copy.*

Rodgers Hydraulic, Inc.

HYDRAULIC POWER EQUIPMENT

7407 WALKER ST., ST. LOUIS PARK
MINNEAPOLIS 16, MINN.

mistic about their work, and if there are a lot of pieces, each requiring the same number of operations, they will grind their tools, or require them to be ground properly, to get the most production out of them between grinds. These men are turning out the maximum amount of work with the equipment they have, so when a raise comes along, they appreciate it, but cannot increase production.

In the small shop, Jake drives to work. On his way he sees a couple of his men walking and stops to pick them up; perhaps Bill, his partner, does the same thing. Bill comes to the shop, looks over the work being done. Each man is doing his best; the partnership is making a little more money than usual; they declare a raise and all the men are benefited.

In such a case it is but natural that production will be increased, yet the grouch says, "It's about time," etc.

Such pessimistic men, in a small shop, can be weeded out and a quite agreeable crowd of workmen can be established.

In such shops where everything rolls smoothly, every man doing his best, a raise may increase production to a degree, but not much.

Where special machinery is installed and is speeded to its maximum, a raise may not boost production, but where raises are few and far between, they may have the right effect.

F. H. Stebbins
Worcester, N. Y.

•

Efficiency is the ability to obtain the best results with the least amount of effort. Best results include finest quality, greatest quantity, and highest profit. Effort includes physical, mental, and financial input.

Since the worker is in the business of selling his services, to be highly efficient, he must get the highest profit for the least effort. The employer must ge the maximum effort from the worker for the least expense, but concessions must be made by each.

The worker will sacrifice high wages for other advantages: pleasant surroundings, agreeable superiors, seniority, and security. The employer sets a standard wage for a reasonable day's work. The type of men who will work for him depends upon the extras. In most cases, these extras attract the best men more than higher wages.

When Al said, "I think that the plants paying the most money get

the best employees," he was wrong. It is true that companies with efficient management can offer more money, but they expect 'cent for cent' returns. Many men prefer the smaller shop where they gain prestige. In the shops offering high wages, there is also a certain amount of politics, whereby friends and neighbors 'share the wealth' rather than the best men.

In checking the production records in one plant, I found that for six months after a general increase in wages was issued, the production per man was actuaally lower than for the previous six months.

Greater efficiency can only be obtained with money by the use of proper incentive systems. By this method, a man can increase his earnings by increasing or improving production.

In another plant, a wage-incentive system was introduced, but records for four months showed that more money was being spent for labor for less production, indicating it was not the proper kind.

There are instances where production was increased with an increase of wages, but they are few and far between. If the steel workers receive a ten cent an hour raise, will the production rate increase? Past records of wage and production increases will show that any increase in the latter was due to new equipment or better facilities, not from wage increases.

Frank J. Zarnowski
Rutherford, N. J.

●

EASE IN OR BREAK IN?

I think Al is right in deciding to make a study of new men. Men are so different in habits, ability, preferences, and ambition that it is too much to expect that the best a man is capable of can be obtained by any hard and fast rule. A study of each individual gives the employer a chance to approach each individual in a way to insure good results.

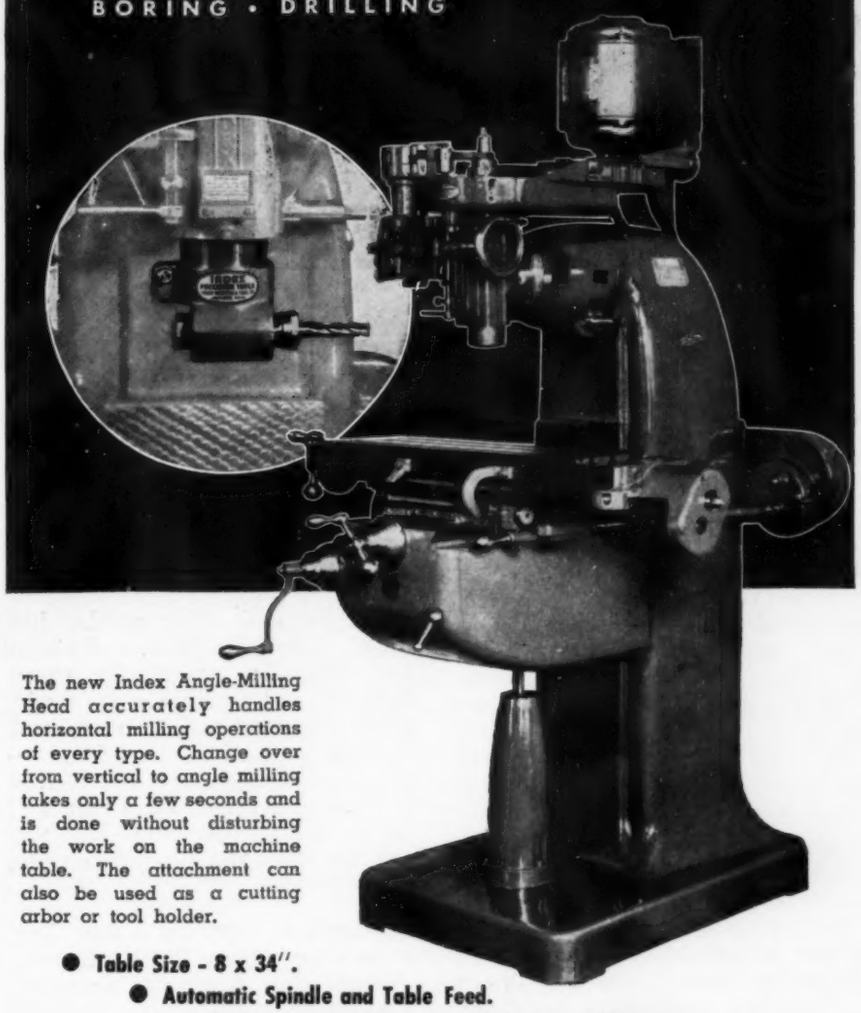
Each and every shop may have some features not found in others, even though they may be engaged in the same line of work. In fact, a man prefers the one which most closely synchronizes with his views and desires.

It is not fair to either the employer, or the men, to work out this problem on the basis of questions and answers exchanged at the time of hiring.

The new man should be started on a rather simple job; however, being careful that it is not too simple, lest he feel that his ability is

Increase Production Range
with the
NEW INDEX MILLING MACHINE

VERTICAL • HORIZONTAL • ANGLE MILLING
BORING • DRILLING



The new Index Angle-Milling Head accurately handles horizontal milling operations of every type. Change over from vertical to angle milling takes only a few seconds and is done without disturbing the work on the machine table. The attachment can also be used as a cutting arbor or tool holder.

- Table Size - 8 x 34″.
- Automatic Spindle and Table Feed.
- Twelve variable cutter speeds up to 2450 rpm.
- Three table speeds can be varied indefinitely.

The Model 50 Index Milling Machine offers a greatly increased range of working capacity over any machine of comparable size or cost, plus a substantial saving on production time and labor. The sound engineering and solid construction of the machine make an extremely rigid unit without deflection or chatter.

A quick change full-geared table feed mechanism delivers power to the table through a splined feed shaft. The Key Way of the Lead Screw is eliminated, increasing precision and sensitive operation. Hand finishing is reduced to a minimum.

Other features of the Index Milling Machine include precision ground Lead Screws, large, easy-to-read Angle Dials, Automatic Controls throughout and a full line of accessories.

Send Today for the NEW INDEX CATALOG

INDEX MACHINE CO.
540 N. MECHANIC STREET JACKSON, MICHIGAN

STEEL HARD TO GET?

Demand Still Exceeds Supply But . . .

. . . this is a typical view of night loading operations at a Ryerson steel-service plant. The steels specified on several orders are on their way to a loading platform for delivery the following morning. Possibly none of these orders are completely filled—however, the fact remains, we are doing our very best to serve a large group of steel users.

Unfortunately, it often seems that the particular steel **you** want is never on hand, and it is true that we are always short of some kinds and sizes. But our stocks turn over fast. A size that is out today may be in tomorrow. And in spite of current conditions, we still believe the over-all stocks at our thirteen plants are the nation's largest.

Carbon and alloy steels, hot rolled or cold finished, and stainless steel in practically every analysis and finish are in stock, ready for your call. So do not hesitate to get in touch with us—on any requirement. You'll find that every Ryerson steel man will do everything possible to help you get the steel you need, when you need it.

Joseph T. Ryerson & Son, Inc. Plants at: New York, Boston, Philadelphia, Detroit, Cincinnati, Cleveland, Pittsburgh, Buffalo, Chicago, Milwaukee, St. Louis, Los Angeles, San Francisco.

PRINCIPAL PRODUCTS

Bars—hot and cold rolled alloy steel reinforcing
Structurals
Plates—
Inland 4Way Floor Plate
Mechanical Tubing
Boiler Tubes and Fittings
Allegheny Stainless—sheets, plates, shapes, bars, tubing, etc.
Sheet and Strip Steel
Tool Steel
Wire, Chain
Bolts, Rivets
Babbitt
Metal Working Tools & Machinery, etc.

RYERSON STEEL

not appreciated, and he therefore, become discouraged. It is better to give him work at first that will demand skill, although preferably something of no great material value.

John Mark May
Watervliet, N. Y.

NEW BOOKS

BENTLEY'S MACHINE SHOP COMPANION—*Published by The Bentley Publishing Company, Manchester, England. 181 pages. Price 2s. 6d.*

A strictly practical manual, this pocket-size book contains text and drawings depicting virtually all types of machine-shop equipment, tools, attachments and power devices. Descriptions of techniques and tabulations of machine data aid the machinist, and especially the apprentice, in managing the run of shop work.

•

TOOL STEELS SIMPLIFIED. *Second Edition. By Frank R. Palmer, vice-president and George Luerssen, chief metallurgist, The Carpenter Steel Company. 564 pages. Published by the Carpenter Steel Company, Reading, Pa. Price $2, postpaid in the U.S.A.; $2.50 elsewhere.*

In these days of rising book-publishing costs, this toolmaking handbook is a bargain to any user of tool and die steel.

The second edition includes information on new and improved steels, new types of heat-treating methods since the first edition 10 years ago. But the purpose remains the same: to help shop men to select the proper steel for each job, to simplify heat-treating, to reduce tool failures.

The question of "How Long to Heat" tool steel is answered effectively in a new chapter, and shows why one furnace will bring the work to heat faster than another, particularly with respect to time in various kinds of furnaces. Other new chapters cover a tool steel selector, and high-speed and hot-work steels. These new chapters are valuable in themselves, but the reader can not overlook the need for a revised, up-to-date handbook on tool steels, particularly when much unpublished information has been worked into the 21 chapters.
the 21 chapters. Here is a real bargain in information, proved by time and popularity of the first edition.

HOT-DIP GALVANIZING PRACTICE. *Second Edition. By W. H. Spowers, Jr., President of Spowers Research Laboratories, Inc. 188 pages. Published by the Penton Publishing Company, 1213 W. Third St., Cleveland 13, Ohio. Price, $6.*

This book is not highly technical, but it does cover in clear language the steps involved in galvanizing wire products, pipe, pipe fittings, sheets, stamped ware, range boilers and barrels. Drawings and sketches are given of various kinds of galvanizing kettles. New feature in the second edition is the matter dealing with construction and operation of typical modern galvanizing plants.

A good understanding of galvanizing steps can be obtained from the book; notably from the discussions of fluxing, control of oxidation in galvanizing kettles, and temperature control of kettles. For a person wishing a ground work in the subject, this book will adequately serve, and his further study of the art will be guided by the excellent bibliography supplied.

NON-STANDARD THREADS —*CORRECTION*

In *A.M.*, Feb. 12, 1948, "How to Turn Non-Standard Screw Threads," by Ernest L. Schlage, three things are wrong.

1. Cone centers ought not be used at a taper angle anything like 8°. The right way is to use a ball from a ball bearing between two countersunk centers.

2. The arrangement of lathe dog and faceplate shown in the illustration is poor. With proportions scaled from the drawing and a taper angle of 8° 6′ mentioned in the article, there will be a successive gain and loss of about 10° in each half turn. That is, for each half revolution of the lathe spindle, the screw will turn alternatively about 190° and 170°.

Even if a special universal dog were used, at the 8° taper angle the least variation possible would be plus and minus 17′ in each quarter turn.

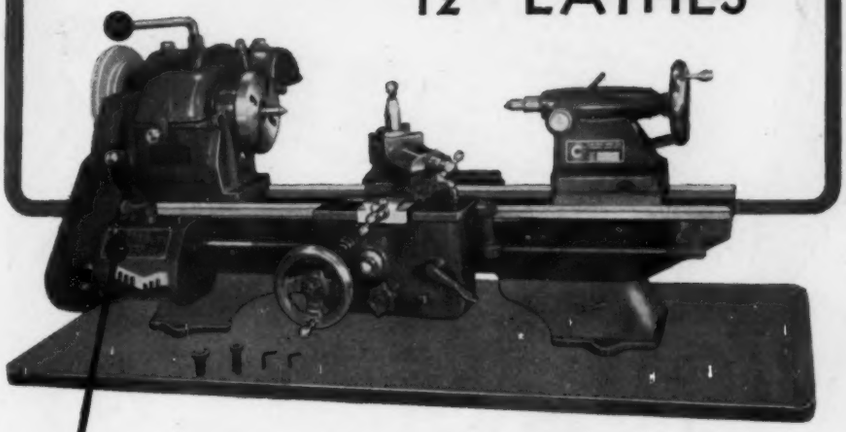
3. Instrument work is usually assumed to call for precision accuracy.

This lathe method should never be employed for precision work. It may justifiably be used when only a slight change in lead is required, as for instance in allowing for the slight change of length in a tap when it is hardened.

Allen H. Candee
Rochester, N. Y.

Clausing

DUAL QUICK CHANGE
12" LATHES



48 THREADS AND POWER FEEDS AT YOUR FINGERTIPS

Designed for wide range performance and utmost ease of operation. The Clausing Dual Quick Change 12" Lathe gives instant selection of 48 threads and feeds . . . simply by shifting two levers. Gives finer feeds instantly without stopping lathe. Saves set-up time and operating time on any turning operation requiring power feed. Easy-to-read chart shows lever and gear positions. The Synchronized Gear Box is of "big machine" design and construction. Liberal use of precision ball bearings on which shafts turn readily, with a minimum of friction. Gears are machine cut, ½" wide for greater strength and longer life. Compare the Clausing Quick Change with lathes in this price range.

ADDITIONAL Clausing FEATURES

Precision ground bed with two flat and two vee ways . . . Adjustable Timken tapered roller bearing headstock . . . Ball bearing friction clutch countershaft . . . Nine spindle speeds from 33 to 2400 r.p.m. . . . Hooded V-belt drive . . . Automatic apron . . .

For smooth, accurate performance, greater convenience and lasting satisfaction investigate Clausing Lathes today.

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227 RICHMOND AVE. OTTUMWA, IOWA

MAIL COUPON FOR DETAILED SPECIFICATIONS

CLAUSING MANUFACTURING CO.
227 Richmond Ave., Ottumwa, Iowa

Please send complete literature on Clausing Precision Lathes.

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Address .....

City .....

State .....

WORKS by itself

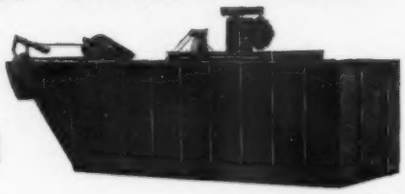
Soluble oil and water coolants are clarified automatically in the Hoffman Flotation unit. Sump cleaning is eliminated — there are no filter aids to add or change — no screens to plug — no need for constant, costly maintenance.

The principle of the Hoffman unit is simple, unique and entirely mechanical. Dirty coolant enters a tank and is aerated by a rotor-stator. Waste solids are held in suspension by froth and skimmed off, in near-dry condition, automatically.

and PAYS for itself

Productive time is increased because machines can be operated continuously without "down" time and labor for cleaning sumps. Wheels, diamonds and soluble oils last longer. On top of these savings you get better, faster machining—vastly improved quality control. In the actual experience of scores of users, these savings have been more than enough to write off the cost of Hoffman Flotation units in incredibly short periods. Ask us to furnish the facts.

HOFFMAN *Fully Automatic* FLOTATION EQUIPMENT for COOLANT CLARIFICATION



Hoffman Flotation equipment is built in standard sizes with flow rates from 20 to 1,000 gallons per minute. Larger sizes built to specification.

The complete line of Hoffman coolant clarification equipment also includes Pressure, Vacuum, Cartridge and Disc Filters. Also, the new Hoffman Oil Conditioner Unit for removing soluble and insoluble impurities. Literature and a Free Survey are available, without obligation — ask for them now.

Get Full Details and a FREE Survey

U. S. HOFFMAN MACHINERY CORPORATION
211 Lamson St., Syracuse, N. Y.
COOLANT FILTERS • FILTRATION ENGINEERING SERVICE

TO THE EDITOR

In our post-war reconversion, we are just now getting to the point at which new developments are assuming more and more importance. Many times these developments are featured at conventions and congresses of the various technical societies.

It seems to me that many men miss the opportunity really to obtain the benefits of attendance at a show because they can offer their management no concrete evidence of benefit. These men would make their jobs much easier if, when they returned home from a convention, they would make a report with the thought in mind that it would be submitted to management. If this report were referred to at the time of getting the next year's travel o. k., the conventions would be too crowded, I am sure.

Philip F. Atwood
East Orange, N. J.

Tips
FOR TOP SHOP MEN

223 Multiple shifts and company-owned tools conspire to make a man a stranger on his own job. The old days of pride of possession in tools, workplace or type of tricky job assignment are gone—and they're missed. Give a man his "own" machine or bench when you can, recognize his special abilities, relax when he posts a motto or a pin-up that's his own. Build pride of possession by saying "your" instead of "the company's."

224 Do what you can to assure security to men who deserve it. Fight for them if the casual layoff comes along; build their confidence in you as their champion.

225 Be careful of the easy drift to complacency—the willingness to accept "good enough" instead of "right." Things are either right or not—if you accept slipshod jobs once, they'll be offered you again.

226 Some men think in words, some in drawings, some in models, some in full-size work. Don't be critical if one of your men expresses his idea in a medium different than yours. In other words, if a toolmaker is sure he has an answer and he's competent, let him go ahead. Don't insist on a drawing before he starts.

Names in the News

F. J. Stokes

Francis Dougherty, Jr.

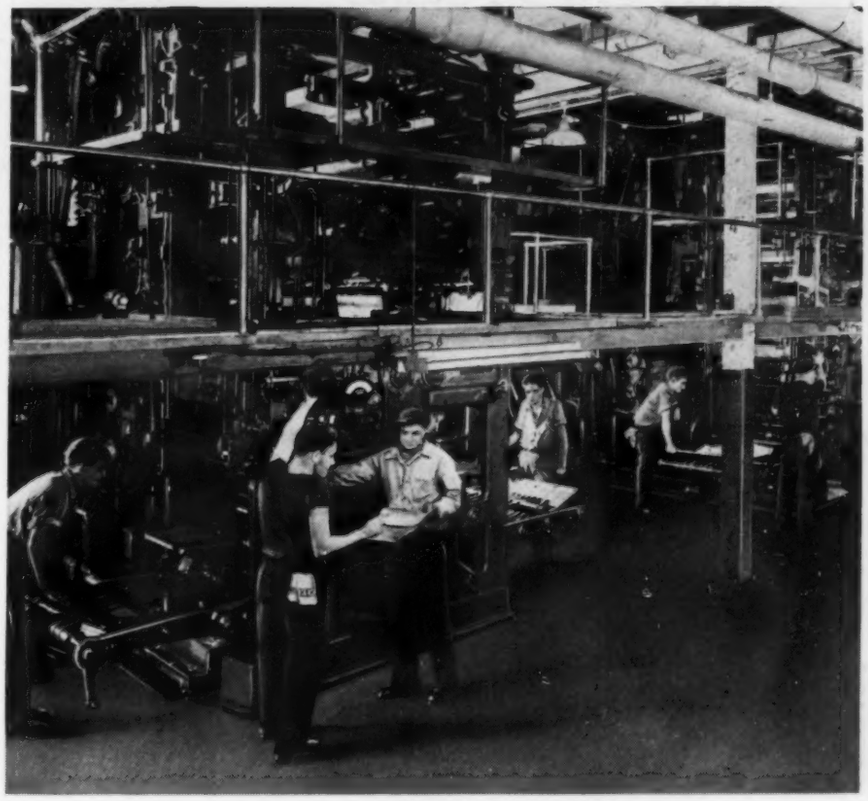
F. J. Stokes, founder and president since 1895 of the F. J. Stokes Machine Co., has become chairman of the board and is succeeded by **Francis Dougherty, Jr.**

M. A. Boyle has been appointed sales manager of the Solder Division of Alpha Metals, Inc., Brooklyn, N. Y.

George Reed, metallurgical engineer with the Timken Bearing Co., has been appointed sales engineer of the company's steel and tube division with headquarters in Houston, Texas.

Robert W. Keer has been elected a vice president and director of the Bingham-Herbrand Corp., Toledo, Ohio, manufacturers of brake lever assemblies and drop forged products. He will be associated with the Herbrand Division of the organization at Fremont, Ohio.

"KEX" *Industrial Wiping* TOWELS



View in McCall Corporation Press Room, Dayton, Ohio.

This prominent publisher of McCall's Magazine and Redbook has discovered the efficiency and economy of KEX Industrial Wiping Towels on a rental service basis.

The reason why KEX Industrial Wiping Towels have won for themselves such an important role is because they have been produced *for wiping only.* They have no harsh seams . . . no hidden buttons . . . no abrasive particles to mar delicate and expensive surfaces.

They come in neat, easily stored bundles that help control distribution—*every wiping towel* in the lot is *thoroughly cleaned and inspected before delivery to you.*

Take your cue from industrial leaders who make it their business to keep operating costs down—and efficiency up.

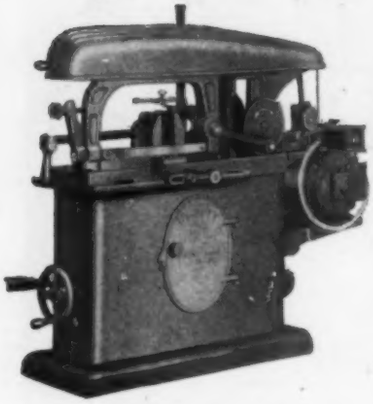
Nothing to Buy—No Expensive Inventory—Just a Low Monthly Rental. The first month should show a decided saving on wiping costs.

For complete information, see your classified Telephone Directory for nearest KEX distributor, or write KEX NATIONAL SERVICE, 295 Fifth Avenue, New York 16, N. Y.

"KEX" NATIONAL SERVICE

REG. U.S. PAT. OFF.

New Patented Feed Control Provides 0 to 70 Pounds Pressure to Saw Blade



Keller No. 3 Hy-Duty Power Hack Saw

New No. 3 Hy-Duty Keller Power Hack Saw has a patented feed control. An easy turn of a hand wheel quickly applies the proper pressure to cut everything from **thin wall tubing** to the **heaviest bar stock** at maximum cutting speed . . . without injury to saw blades.

OTHER FEATURES

Standard equipment includes automatic lift on reverse stroke...quick acting swivel vise . . . automatic safety stop switch—chip free vane type coolant pump...new adjustable foot lift and numerous other features.

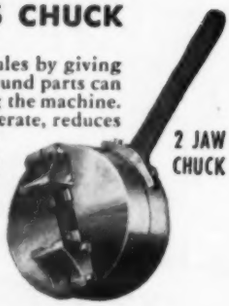
Ask your dealer about this outstanding Keller Power Hack Saw or write Dept. 98.

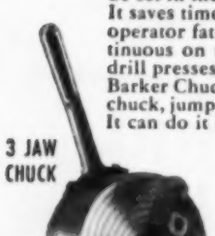
Sales Service Machine Tool Co.
2363 UNIVERSITY AVE. ST. PAUL 4, MINNESOTA

Barker **Two-Jaw or Three-Jaw WRENCHLESS CHUCK**

will pay for itself in 60 to 90 days on production schedules by giving MORE parts per hour at a LOWER cost per part. Most round parts can be set in the Barker Wrenchless Chuck without stopping the machine. It saves time, helps speed up production, is simple to operate, reduces operator fatigue and cuts spoilage where the run is continuous on turrets, engine lathes, cutting off machines, drill presses or any other type of chucking machine. The Barker Chuck shown above, replacing an ordinary 3-jaw chuck, jumped production from 18 to 24 pieces per hour. It can do it in *your* plant too. Let us show you how!

Write for bulletin 201 today.





Chuck Division
THOMAS HOIST CO.
22 S. HOYNE CHICAGO 12

Bernard Lester, pioneer in the training of industrial salesmen and sales methods, has opened a consulting office at 140 Cedar St., New York City. The service is offered managers of medium-sized and small industrial equipment builders and suppliers on sale and distribution of machinery and equipment.

L. C. Watson, formerly with the Trumbull Mfg. Co., has been appointed sales manager of distributor sales of the Allen-Bradley Co., Milwaukee Wis.

Comdr. Edward Hart has been appointed manager of the New York office of the American Engineering Co. He had been previously associated with Peabody Engineering Co. and A. A. Smith Co.

John R. Queen, for the past two years Texrope sales representative in the Allis-Chalmers New York district office, has been named dealer supervisor at New York for the company's Empire region. **James Wilson** has retired as manager of the field engineering section of the company's steam turbine department after 43 years of service. **James M. Barker** of Chicago, chairman of the boards of the Allstate Insurance Co. and the Allstate Fire Insurance Co., has been elected to the board of directors of the Allis-Chalmers Mfg. Co.

Maj.-Gen. Cecil R. Moore, who served for four years in the last war as chief engineer in the European Theater of Operations, has been named manager of the construction department, Shops Division of Koppers Co., Inc.

Robert L. Lowder, formerly district sales engineer at the Link-Belt Co. plant, Atlanta, Ga., has been appointed manager of a new district sales office in Jacksonville, Fla.

L. H. Gillette has been named manager, Heating Section Sales, of the Transportation & Generator Division, Westinghouse Electric Corp. Mr. Gillette is headquartered in Meadville, Pa.

Frederick H. Norton has been named vice president in charge of all sales by American Car & Foundry Co.

Frank A. Gabriel retired recently as sales manager of Perfection Stove Co.'s stove and heater division.

Mellor Jones has resigned as public relations director of the Bullard Co., Bridgeport, to accept the position of assistant to the vice president of the Rodney Hunt Machine Co., Orange, Mass.

John E. Barbier

John E. Barbier has been appointed sales manager of the Murchey Machine Tool Co. and also in charge of tap sales for the Sheffield Corp. **Frank A. Henry Jr.,** has been named field sales manager for Murchey products and **Fred L. Graham,** field sales manager for Sheffield taps. Sheffield acquired the Murchey concern of Detroit last Spring and it is being operated as an independent subsidiary.

Donald B. Huntting has been elected president of the E. Horton & Son Co., Windsor Locks, Conn., **Douglas H. Thomson, Jr.,** vice president, and **Mary A. Caffrey,** secretary. These three were also elected directors along with **H. Bissell Carey, Jr.,** and **Paul Adams.** The company manufactures chucks.

Lawrence B. Richardson, formerly vice president of the Curtiss-Wright Corp., has been elected president of the Fairchild Engine & Airplane Corp. to succeed **J. Carlton Ward, Jr.** Mr. Ward was named chairman of the board.

John M. K. Davis, vice president of Connecticut Printers, Inc., has been named to the board of the Taylor & Fenn Co., Hartford, Conn.

Otto Krauss has been appointed chief engineer of the Gerity-Michigan Corp. He will supervise all technical phases of die casting at the company's Detroit plant.

R. C. Heinmiller has been named chief engineer of the LeMaire Tool & Mfg. Co., Dearborn, Mich., builders of special machine tools.

Joseph P. Klenkort has been appointed general sales manager of the Ramapo Ajax Division, American Brake Shoe Co.

Henry M. Swartwood has been named director of advertising by the Kaiser-Fraser Corp.

OVER ONE HUNDRED YEARS OF CONTINUOUS SERVICE. ROUNDS, SQUARES, FLATS, HEXAGONS, OCTAGONS

BILLETS AND FORGINGS FOR PRODUCTION, TOOL ROOM AND MAINTENANCE REQUIREMENTS.

"B" No. 3X ALLOY STEEL IS

6 ways better!

HY-TEN "B" No. 3X is the ideal alloy for heavy duty parts because (1) it is supplied in the heat-treated condition to your desired physicals (2) it is readily machinable at high degrees of hardness (3) high finish is obtainable with either ordinary high speed or carbide tools (4) scaling, distortion and straightening are eliminated (5) it often eliminates grinding (6) rehandling and added expense of heat treating are avoided. HY-TEN "B" No. 3X is available immediately from warehouse stock at short notice.

WL *steels are metallurgically constant. This guarantees uniformity of chemistry, grain size, hardenability—thus eliminating costly changes in heat treating specifications.*

Write today for your FREE COPY of the Wheelock, Lovejoy Data Book. It contains complete technical information on grades, applications, physical properties, tests, heat treating, etc.

WHEELOCK, LOVEJOY & CO., INC.

137 Sidney St., Cambridge 39, Mass.

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AJAX DISTRIBUTING CO., LTD., TORONTO

HY-TEN and AISI

McCaskey Tool Control in Typical Chance Vought Crib.

How Chance Vought Aircraft Cut Breakage and Other Tool Costs

The Chance Vought Aircraft Division of United Aircraft Corporation adopted McCaskey Tool Crib Control for three cribs ten years ago. Lower tool costs—cut in a dozen ways—quickly proved its value and the McCaskey controlled cribs have increased to 16 with the growth of the plant.

McCaskey Control has been particularly effective in locating and reducing breakage during periods of both top employment and normal operations. Complete accountability for tools and their transfer from one crib to another on the basis of usage data have kept loss and inventories at a minimum.

New and reclaimed tools, stocked and supplied to all the cribs from the Main Tool Crib, are also controlled by a small staff with McCaskey Inventory Control. McCaskey contributes materially to the unusually efficient organization and economical operation of Chance Vought's Tool Department.

Let us have a qualified representative explain how McCaskey Control will save from the beginning in your plant . . . or send you proof of McCaskey savings in several well-known plants.

McCaskey INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • TOOLS • COSTS • PAYROLL

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems Ltd., Galt, Canada — The McCaskey Register Co., Watford, England

McCaskey Inventory Control in Main Tool Crib.

Eward F. Galvin of the Tools Sales Co. has been appointed representative in New York City by the Reed Rolled Thread Die Co., Worcester.

Arthur F. Maha has been named assistant sales manager for the central division of the Ball and Roller Bearing Division, Link-Belt Co., with headquarters in Indianapolis. **Lewis M. Watkin, Jr.,** takes over as assistant sales manager in the eastern division with headquarters in Philadelphia.

BUSINESS ITEMS

Ettco Tool Co., manufacturers of multiple drilling and tapping heads, have moved into a new, fireproof one-story building directly across from the present plant, 594 Johnson Ave., Brooklyn, N. Y.

Buckingham Mfg. Co., Binghamton, N. Y., has purchased the 38-year-old manufacturing business of Carroll R. Tiffany, Conklin, N. Y., makers of tree-pruning tools.

Hanna Engineering Works, Chicago manufacturers of pneumatic and hydraulic cylinders, valves and riveters, have opened a direct factory office in Detroit at 1609 Industrial Bank Building. Frank A. James and W. J. Renaud, formerly with **Vickers, Inc.,** and **Carron Engineering Sales,** respectively, have been appointed to the Detroit office. The company has also named John Furey as representative for the New England States. It was announced also that **Scott Equipment & Engineering Co.,** Dayton, Ohio, will handle Hanna equipment in Southern Ohio.

Sumner & Co., Inc., will expand its Buffalo plant where railway cars are repaired. The present plant will be widened and modern repair machinery and equipment will be installed at an approximate cost of $150,000.

Donald M. Scott, president of the newly-formed **Buffalo Stainless Casting Corp.,** announced the purchase of the **Otis Elevator Co.'s** plant in Buffalo. The property is assessed at $300,000.

The Pyrometer Instrument Co. has moved into a new plant in Berginfield, N. J. Laboratory and office facilities are combined with the manufacturing division.

Leslie Co., Lyndhurst, N. J., manufacturers of pressure and temperature regulators, has appointed the following agents: **Welby C. Rouse,** Greensboro, N. C.; **Equipment Sales Corp.,** Kingsport, Tenn.; and **Landes, Zachary & Peterson,** Denver, Colo.

Ground was broken March 15 for building No. 2 at the Wheatfield, N. Y., plant of the **Carborundum, Co.** The 829 by 230 ft. building, new boiler house and four buildings formerly occupied by **Bell Aircraft Corp.** will be the new home of the Coated Products Division. The company plans to occupy the building in September.

Electric Auto-Lite Co., Toledo, Ohio, has purchased a portion of the surplus **Wright Aeronautical Corp.** plant, Lockland, Ohio. Auto-Lite will consolidate manufacturing operations in numerous scattered plants in Lockland.

The Nelco Tool Co., Inc., has moved from Brooklyn, N. Y., to its new plant at 266 Center St., Manchester, Conn.

Republic Steel Corp. has been awarded a ten-year lease on the government-owned blast furnace and by-product plant in Gadsden, Ala.

General Electric Co. will build a new Parts Department Building at the LaGrange plant of Electro-Motive Division to provide increased capacity for handling parts for diesel locomotives. The Parts headquarters will be the 68th building project to be constructed by Electro-Motive on a site that only 13 years ago was a farm.

Moore Handley Hardware Co., Inc., Birmingham, Ala., has been appointed sales distributor in Alabama for the **Landis Tool Co.** and will handle the complete line of precision cylindrical grinding machines.

G. G. Greene, Jr., and associates have purchased the **Bashlin Co.** plant at North Warren, Pa., valve manufacturer since 1901. J. E. Hazeltine, who has been associated with the firm since it was founded will remain in an advisory capacity.

Westinghouse Electric Corp. has purchased 20 acres of land and four three-story buildings at Hahntown, Pa., two miles south of Irwin. The property was formerly owned by the **General Foods Corp.** and was occupied by one of its divisions. This purchase was part of $132-million long-range, company-wide expansion and improvement program.

B. L. Sylar & Son, 105 Belvoir Ave., Chattanooga, Tenn., has been appointed sales distributor in Tennessee for the **Landis Tool Co.** and will handle that company's line of precision cylindrical grinding machines.

Island Equipment Corp., with offices at 101 Park Ave., New York

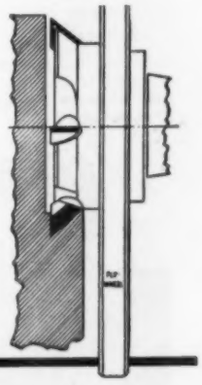
Compare

THESE RESULTS WITH YOUR BEST!

New Lovejoy Dovetail Cutter

The NEW Lovejoy Dovetail Cutter offers a faster and more economical method for forming dovetails, milling vee-slots or cutting angles. The following performance data is typical of the results which can be expected—compare it with your best!

OPERATION:	*Milling Dovetail Slots*
MATERIAL:	*Cast Iron*
FEED:	*13 Inches per Minute*
SPEED:	*200 R.P.M.*
DEPTH OF CUT:	*½ inch*
TIP MATERIAL:	*883 (Tungsten Carbide)*



PERFORMANCE: The 6" Lovejoy Dovetail Cutter has 6 blades and is run with 70 lb. Lovejoy Flywheel. The cutting action is free and even, finish very smooth. After running 1400 lineal inches to complete the job, the blades showed negligible wear.

"TOOL BITS"

The job described above brings up the subject of Flywheels. When are they necessary? There is no standard rule, but it is well to study possible advantages when cutters are light in weight or of small diameter. They are of special value when cutting steel. Lovejoy manufactures a complete line of flywheels for any machine spindle for driving bolt-on mills or National Standard arbors. We will be pleased to make recommendations based on the following information—machine, make, material to be cut, blade material, etc.

Lovejoy
TOOL COMPANY, INC.
SPRINGFIELD, VERMONT

CROSS UNIVERSAL GEAR MACHINES

for

- ROUNDING
- CHAMFERING
- POINTING
- BURRING

Cross Universal Gear Machines embody advanced engineering developments to obtain highest productivity and assure lowest possible operating costs.

They feature utmost flexibility for handling a wide variety of gears. Continuous cutting motion, exclusive with Cross, speeds production at top efficiency.

Special skill is not required because machines are automatic and push button controlled. Power clamping is foot pedal controlled. Both hands are free for work handling.

No. 55

For rounding, pointing, chamfering or burring external and internal:

spur gears
helical gears
clutches
splines

Typical productivity when rounding or pointing 8 pitch 30 tooth gears is 55 net hourly.

No. 65

For pointing or chamfering external and internal:

clutches
spur gears
bevel gears
splines

Typical productivity when pointing 10 pitch 30 tooth gears is 100 r at hourly.

No. 75

For burring or chamfering both ends at the same time.

helical gears
spiral bevel pinions
hypoid pinions

Typical productivity when chamfering 8 pitch 40 tooth gears is 200 net hourly.

CROSS COMPANY

Established 1898

SPECIAL MACHINE TOOLS
MILLING • DRILLING • TAPPING • BORING
TURNING • SHAPING • GRINDING • HONING

DETROIT 7, MICHIGAN

City, and factories at Hollis and Queens Village, L. I., has purchased a plant formerly occupied by **Brewster-Rolls Royce** organization, Long Island City. Factories and offices will be housed in the new structure. The corporation builds conveying equipment.

OBITUARIES

W. B. duMont

William Beltran duMont, 55, president and founder of the duMont Corp., Greenfield, Mass., makers of keyway broach kits and other small tools, died March 22. He was born in Sheffield, Ala., and was educated in Massachusetts. Mr. duMont started work with Greenfield Tap & Die Corp., later becoming salesman. After serving in the Navy during World War I he was appointed export sales manager, general sales manager and then vice president in charge of sales. He resigned in 1939 and on Jan. 1, 1940 became vice president and director of the Threadwell Tap & Die Co. He founded the duMont Corp. in 1946.

Arthur W. Coppin, secretary of Foote Bros. Gear & Machine Corp., Chicago, died March 2. He was born in Milwaukee, Wis., Oct. 21, 1896. A well-known member of the Chicago Bar Association, Mr. Coppin joined the corporation in Feb., 1943, and was elected secretary and counsel in 1946.

Florian J. Mantel, precision machinist and organizer of the American Gas Engine Co., Syracuse, N. Y., died March 22.

John A. Foster, 70, veteran machine shop superintendent, Rochester, N. Y., who retired two years ago, died March 18 in Lakeland, Fla.

Donald W. MacDonald, 62, vice president and director of the Erie Foundry Co., Erie, Pa., died March 19. He joined the company in 1915.

MODERN TESTING METHODS— What they are... How to use them...

"Non-destructive Testing Methods", a 24-page *American Machinist* Special Report, gives all the facts on how to scientifically test parts, pieces, structural materials, rough castings, dies, and any other formed piece subject to defect.

This Special Report explains in detail the supersonic, radiographic, spectroscopic and magnetic methods of Inspection . . . points out how each can be used effectively. Illustrations, graphs, photographs, clarify the factual, authoritative text.

Non-destructive testing, recognized as the most practical way of checking on a production basis, is particularly important because a thorough check at all points is possible without damage to the part or material being tested. This compact, up-to-the-minute survey on non-destructive testing goes into the many new or improved methods used today, points out their particular advantages.

If you would like copies for distribution to your staff or for your own ready reference, we have a limited number available for distribution at 10¢ each.

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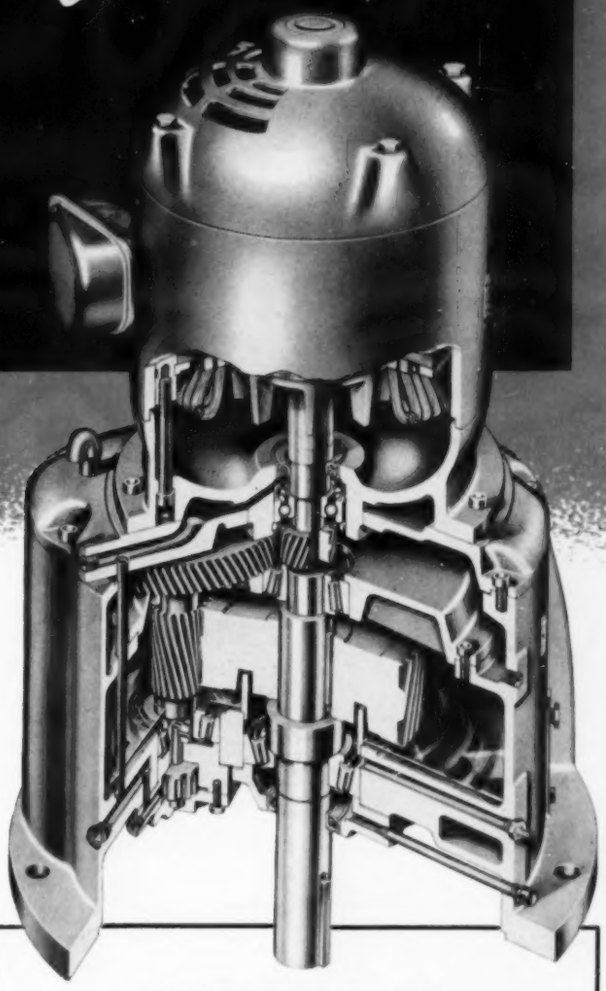
Magazine of Metalworking Production

330 W. 42nd STREET
NEW YORK 18, N. Y.

LATEST ADDITION TO A POPULAR FAMILY...

The New Westinghouse

VERTICAL GEARMOTOR



—powered by the revolutionary new Westinghouse Life-Line Motor

Here's a vertical gearmotor that's new . . . in its streamlined appearance . . . and in advanced features that improve power transmission and cut maintenance costs. It's the Westinghouse Type M—designed for utmost efficiency, powered by the Westinghouse Life-Line Motor. It takes its place as an important member of the popular line of Westinghouse Geared Drives —which includes horizontal gearmotors for applications up to 75 hp.

Each unit is a self-contained drive, available in ratings of 3 to 50 hp—in a range of ratios from 7.61:1 to 38.9:1—in a choice of enclosure types, including open-protected, semi- or totally-enclosed, and explosion-proof.

Compact and easy to install, the Westinghouse Type M Gearmotor will solve your vertical slow-speed drive problems. Ask your Westinghouse representative for help on your applications.

FEATURES OF THE *NEW TYPE M GEARMOTOR...*

- **POSITIVE LUBRICATION** of gears and bearings at all operating speeds
- **BPT HEAT TREATMENT** of gearing, to assure maximum load-carrying capacity and long service life
- **EASY ACCESSIBILITY** for inspection and maintenance
- **SIMPLIFIED DESIGN** . . . new, streamlined appearance
- **POWERED** by Life-Line Motor . . . greatest advance in motor design in 58 years

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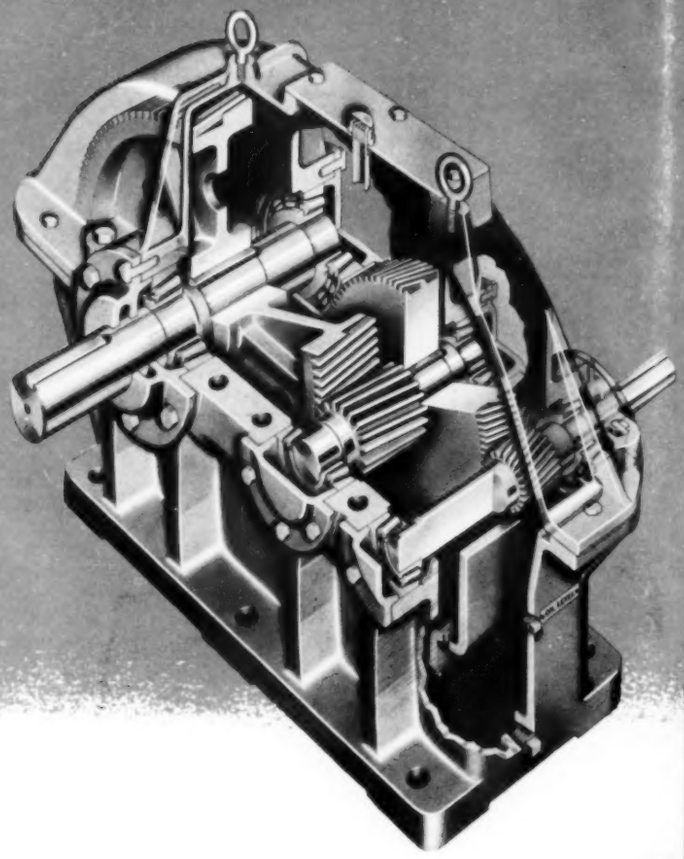
PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

HARNESS

RPM

WITH WESTINGHOUSE SPEED REDUCERS



HERE'S EFFICIENT, ECONOMICAL REDUCTION FOR ANY PRIME MOVER . . .

Westinghouse Speed Reducers provide the speed-reduction ratio needed—with high power-transmission efficiency. Rugged, durable and powerful, they are particularly suited for heavy-duty operations, for drives up to 1,000 hp.

This ruggedness and high efficiency is achieved by skillful design and precision manufacturing methods, the result of over half a century of Westinghouse experience in producing gearing and geared drives. It's your assurance that the drive you buy meets your requirements for accuracy and dependability.

WESTINGHOUSE IS HEADQUARTERS FOR INDUSTRIAL GEARING, with specialized facilities for the design and production of spur, single-helical or double-helical types, up to 10 ft. in diameter. Your gearing inquiries will be given immediate attention. Orders are filled promptly —manufacturing facilities are immediately available.

TYPE DH DOUBLE-REDUCTION SPEED REDUCER is available in 15 standard ratios in each of 12 sizes. TYPE SH SINGLE-REDUCTION SPEED REDUCER available in 13 standard ratios in each of 12 sizes.

CHECK THESE FEATURES

- **SINGLE-HELICAL GEARING**—heat-treated by the exclusive Westinghouse BPT process
- **ANTI-FRICTION BEARINGS**—for reduced power losses
- **SIMPLE, POSITIVE LUBRICATION**
- **EASY ACCESSIBILITY**—rugged case of split construction

For complete information, call your nearest Westinghouse office, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh, Pennsylvania.

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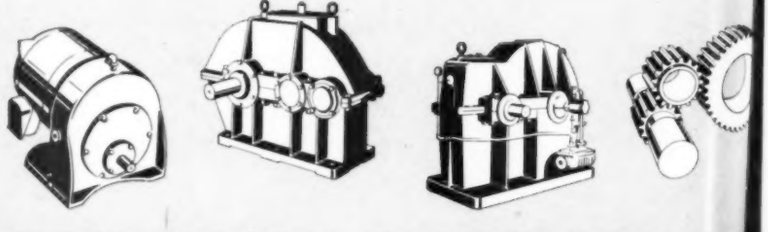
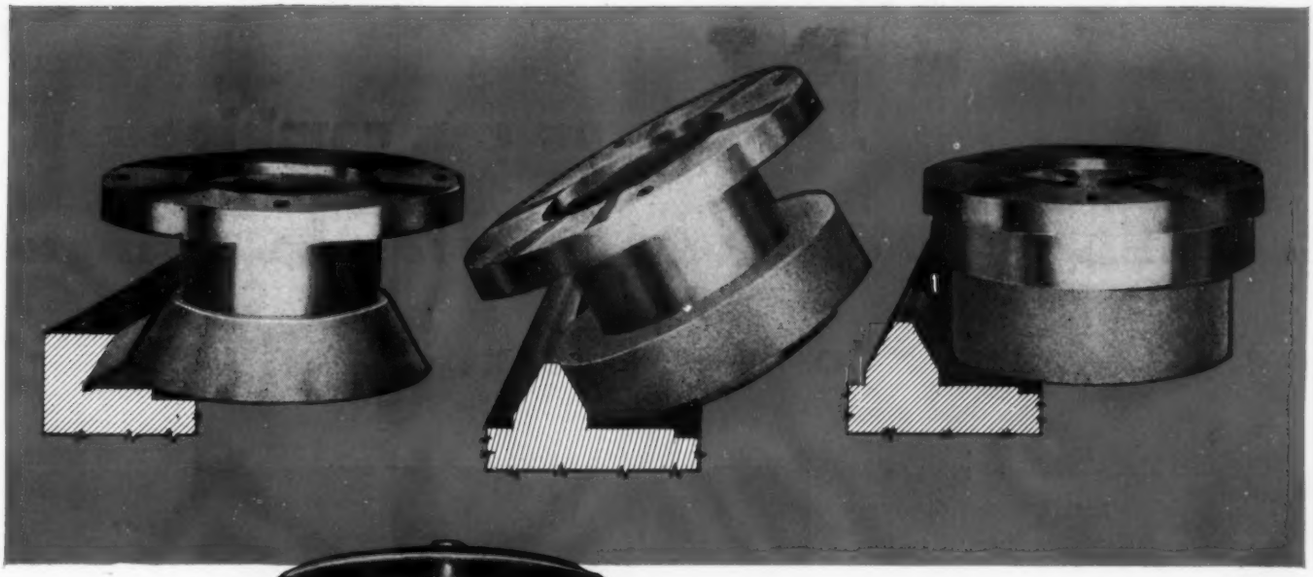
Litho in U.S.

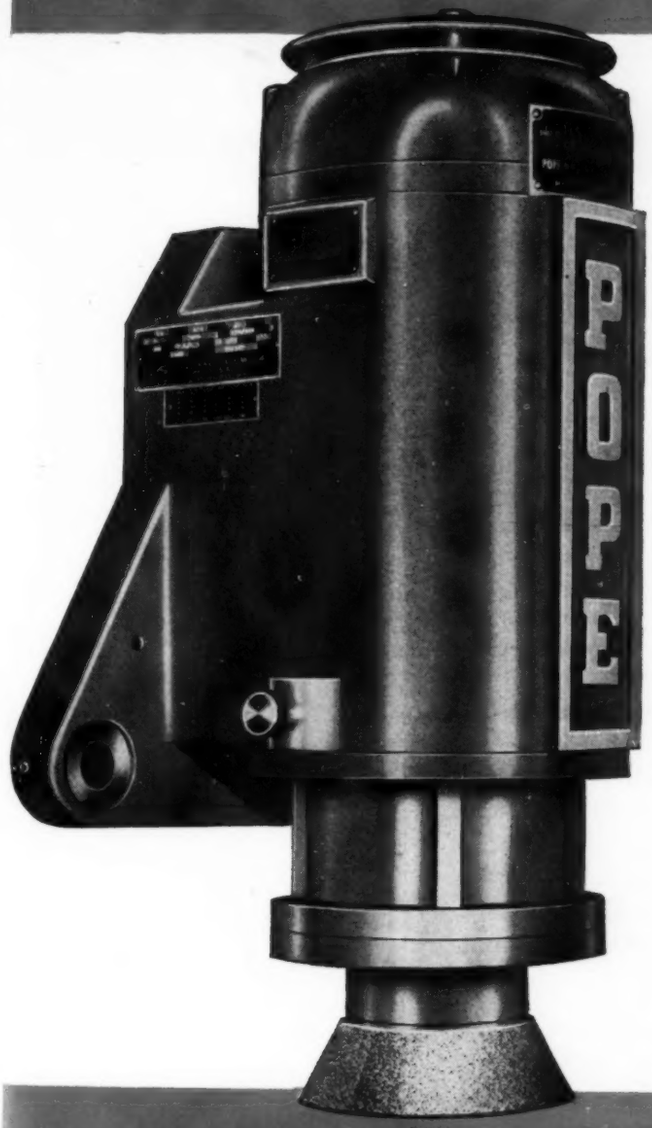
Westinghouse

RPM **FITTED DRIVES**



GEARMOTORS • SPEED REDUCERS • SPEED INCREASERS • INDUSTRIAL GEAR





Versatile IS THE WORD FOR THIS POPE MOTORIZED GRINDER SPINDLE . . .

Every user is enthusiastic about the performance of this powerful Spindle with *sealed-in* lubrication and totally enclosed, fan cooled motor. It has the bearing capacity and the rigidity to *rough off surplus metal fast* and produce superior final finishes as well.

As you see, it may be equipped with a wide flange spindle nose for *quick mounting* of various types of grinding wheels or other tools which are readily attached by easy-to-get-at screws. No fumbling around for blind holes.

This useful and popular Spindle comes in 3, 5 and 10 HP, 1200, 1800 and 3600 RPM. Other HP's and speeds are available on special order. Write for Data Sheets 16, 17, 18 and 19.

No. 42

POPE

TRADE MARK REG. U.S. PAT. OFF.

POPE MACHINERY CORPORATION

ESTABLISHED 1920

261 RIVER STREET • HAVERHILL, MASSACHUSETTS

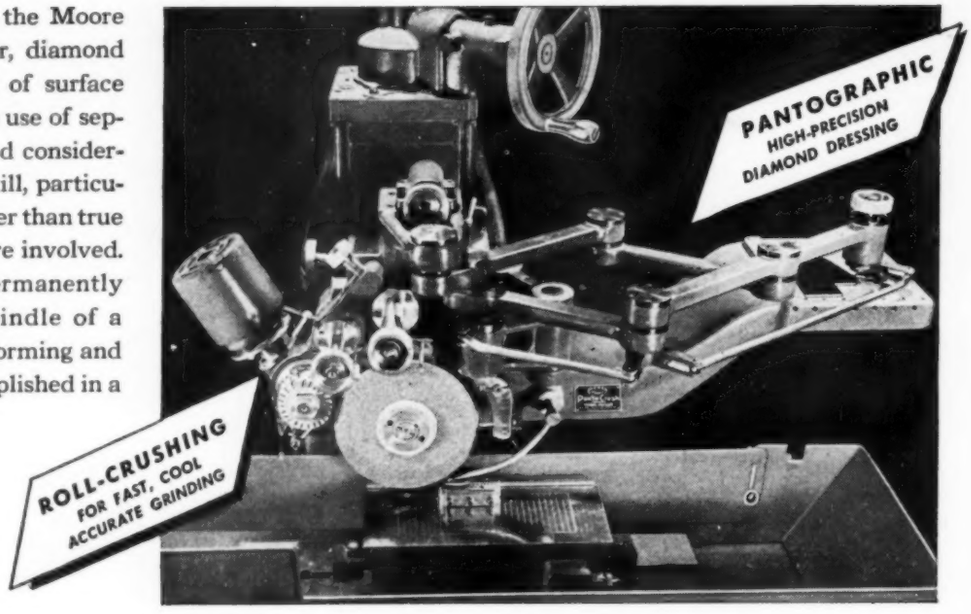
BUILDERS OF PRECISION SPINDLES

Now you can combine roll-crushing and diamond dressing in a single wheel dresser to speed form grinding

Before the development of the Moore Panto-Crush Wheel Dresser, diamond dressing and crush-forming of surface grinder wheels called for the use of separate devices. These required considerable set-up and operating skill, particularly where odd contours other than true radii and straight surfaces are involved.

Now with the Moore, permanently mounted on the wheel spindle of a surface grinder, both crush-forming and diamond-dressing are accomplished in a single mechanism.

Here's how this 2-in-1 machine does it:



1. Combines Pantograph, working directly from template, and *Roll-Crushing* in one device, accurately related to spindle.

2. Switches from one method to the other without disturbing workpiece setting or location of either trueing device.

3. No setting up of complex attachments each time wheel is dressed ... no raising of wheel spindle from work to dress, yet wheel spindle may be raised or lowered without losing relation of wheel form to dressing device ... crusher method saves diamond costs.

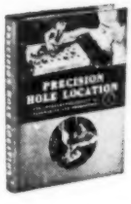
4. Assures highest roll-crushing accuracy and economy. Crusher roll is *ground* and *used* on same spindle, without disturbing position ... no expensive machine required to grind crusher roll ... no worry about hardening distortion, because roll is ground *in place* from the solid directly from template.

5. Takes Skill out of job, yet adds advantage of crush dressing for heavy cuts without heating work, and ultra-precision diamond dressing.

6. Device need not be removed to use machine as conventional surface grinder.

Both MACHINE DESIGN and MACHINERY magazines devoted considerable editorial space to technical discussions of the value of this ingenious new mechanism. We'll be glad to send you reprints and a descriptive catalogue on Panto-Crush.

MOORE SPECIAL TOOL CO., Inc.
738 UNION AVENUE, BRIDGEPORT 7, CONN.



HAVE YOU BOUGHT YOUR COPY OF "PRECISION HOLE LOCATION"?

Over 5,000 copies of this valuable book on toolmaking practices have been sold to date. Available at special price of $3 in U. S. A.; $3.50 outside U. S. A. 448 pages, over 400 illustrations. 184 pages of Woodworth Coordinate Location Tables from 3 to 100 holes. Send check or money order to Moore Special Tool Co., Inc., Bridgeport 7, Conn.

Add a MOORE to YOUR TOOLROOM

JIG BORERS · JIG GRINDERS · PANTO-CRUSH WHEEL DRESSERS
DIE FLIPPERS · COMPLETE LINE OF HOLE LOCATION ACCESSORIES

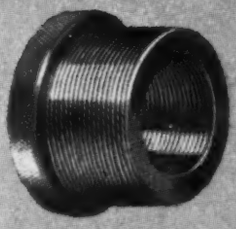
18 SECONDS
Diameter 2" Length ½"
TPI 12 SAE X-1315 Steel

Sentinel CRI-DAN

HIGH SPEED, SEMI-AUTOMATIC THREADING MACHINE

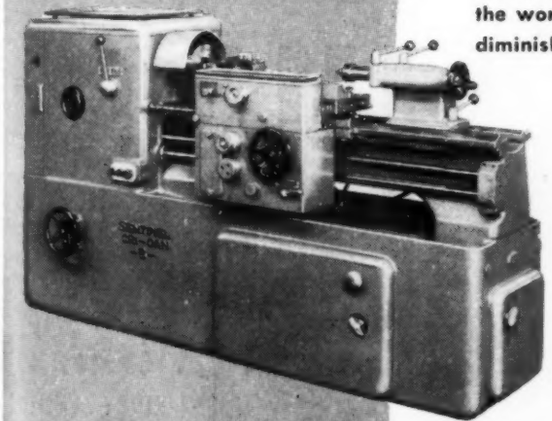
For cutting internal, external, right or left hand, tapered, multi-start, triangular, square, trapezoidal or round threads, etc.

The New SENSATIONAL THREADING MACHINE!



12 SECONDS (Ext.)
Diameter 1¾" Length 1"
TPI 16 SAE 1040 Steel
(Int. 15 Seconds)

6 SECONDS
Diameter 2⅓" Length ¾"
TPI 16 Brass



CUTS THREADING TIME from MINUTES to SECONDS

UNVEILED AT THE "ASTE" SHOW in Cleveland on March 15th, the Sentinel Cri-Dan Threading Machine was proclaimed by many "the most outstanding development exhibited at the show".

Unbelievable threading speeds and versatility are achieved in this sensational machine in which the cutting tool is traversed through the cut at speeds up to a hundred passes per minute while thread size or pitch diameter is held to tolerances of thousandth of an inch.

The threads are generated by a single point high speed or carbide tool, a multiplicity of cuts being taken across the work piece, employing constant or diminishing rate of infeed, depending on the threading job to be done.

No relief need be provided for the tool. The tool is automatically cleared back out of the cut at the end of each pass . . . tool life is very high.

In addition to its high production capabilities, the remarkable wide range and quick fifteen minute change over to completely new assignments, make this machine a "natural" for short or extremely varied runs. Automatic indexing enables up to 12 start threads . . . tapered threads up to 20° can also be cut.

If you are interested in reducing threading time from minutes to seconds . . . *mail the coupon!*

Distributed in the United States by

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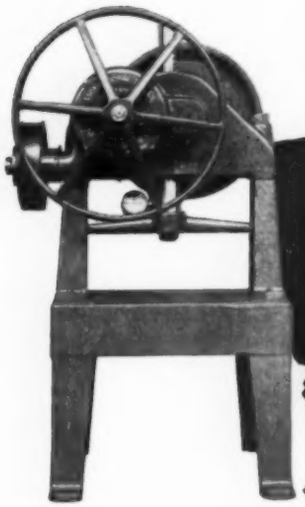
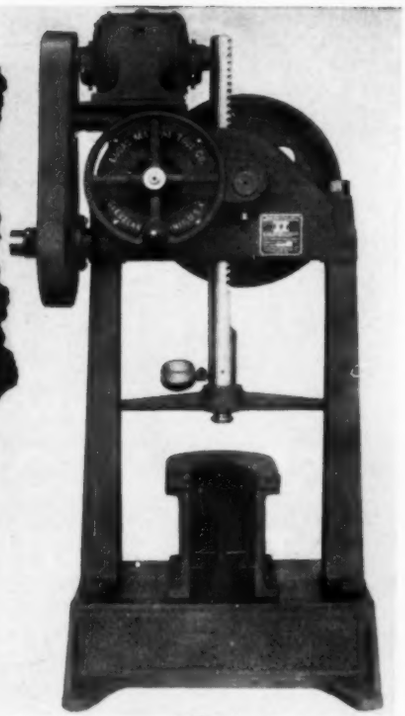


Back in Production!

LUCAS POWER FORCING PRESSES

Vertical Table Type Press. Made in 15 and 30 Ton Sizes Only.



Standard Vertical Press. 15, 30 and 50 Ton Sizes.

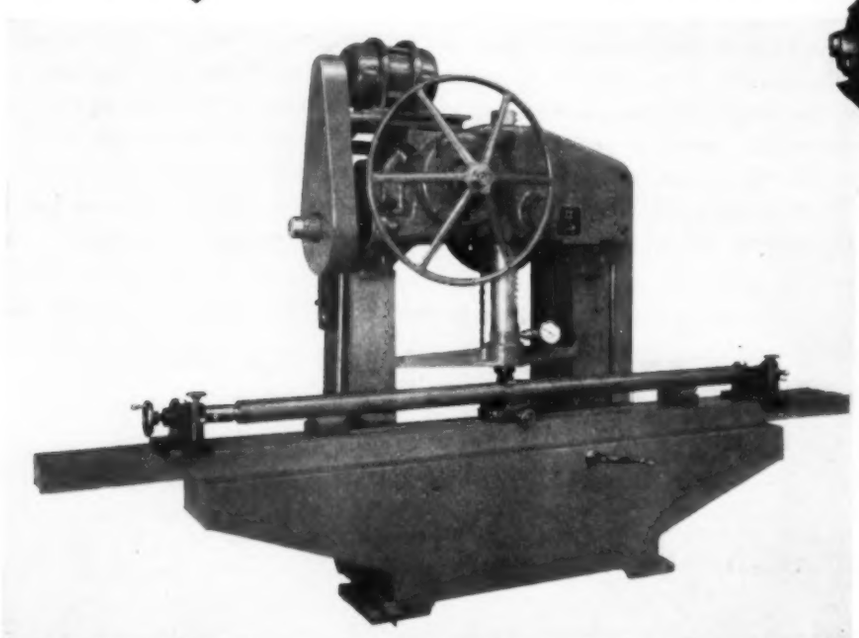
with all the traditional LUCAS Precision and Quality

This Press is designed for the range of work between the hand or screw press and the hydraulic press, which it handles better than either. It is exceedingly simple and effective, and does rapidly and BY POWER a large variety of operations requiring pressure, such as forcing arbors (mandrels), bushings, shafts or pins in or out of holes, linings into pumps, seats into valves, etc., bending or straightening, forming, marking, broaching, sizing holes with hardened plugs, burnishing or expanding babbitt bearings, testing castings or anything in which a predetermined stress of any nature must be resisted, sealing valves while testing for leaks. Has many uses in building electric motors.

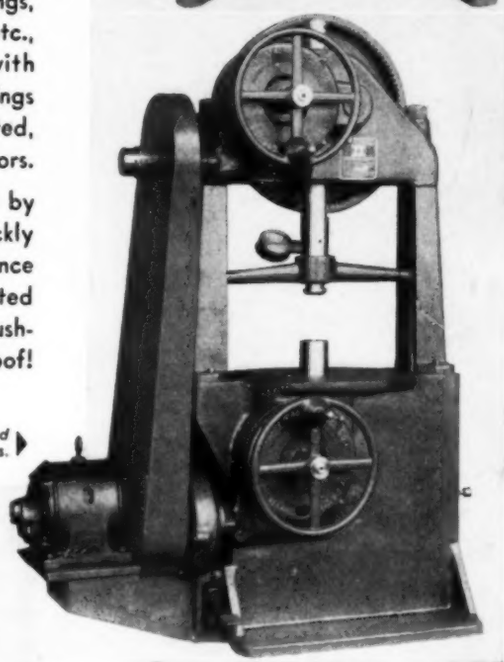
The working elements consist of a ram, to which motion is transmitted by means of gearing. The handwheel is used to raise or lower the ram quickly and automatically applies the power when the ram meets with the resistance of the work, the amount of pressure being proportionate to the force exerted on it. When the handwheel is released, or when the resistance ceases (as in pushing things out or off) the action of the Press ceases, making it accident proof!

Presses are Made of 15, 30 and 50 Tons Capacity

Straightening Press Made Only in 50 Ton Size.



Combination Inverted and Vertical Press – Two Rams.



LUCAS

MACHINE TOOL COMPANY

12302 KIRBY AVENUE
CLEVELAND 8, OHIO

MANUFACTURING EXCLUSIVELY 3, 4, 5 AND 6 INCH SINGLE SPINDLE HORIZONTAL BORING, DRILLING AND MILLING MACHINES

Bring your Bearing files up to date!

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ORANGE ROLLER BEARINGS

ORANGE ROLLER BUSHINGS

Widely used for their high load-carrying capacity in small space, plus smooth, quiet, long-life operation. Roller clearances are held to a minimum, providing closer internal running clearances. This reduces possibility of misalignment of rollers while running. Available in a full range of standard sizes and types, with and without inner races.

ORANGE *Cage Type* NEEDLE BEARINGS

Exclusive cage design holds rollers in permanent alignment with raceway, eliminating skewing—can be used in vertical or overhung applications — are less affected by misaligned mountings. Due to precisely controlled and minimum internal clearances, they are especially adapted for spindles and high speed applications. Smoother running, less internal friction, longer life hours expectancy. Wide range of popular shaft sizes.

ORANGE "STAGGERED" ROLLER BEARINGS

The famous heavy-duty bearings that do the work of larger-size conventional bearings. Exclusive staggered roller arrangement distributes load over many short rolls, instead of a few full length rolls. This insures an even-running bearing of greater load-carrying capacity. Full range of standard sizes interchangeable with other solid race type bearings.

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554 Main Street, Orange, N. J.

Mail Coupon for Engineering Data

Orange Roller Bearing Co., Inc. AM
Orange, N. J.

Please send full set of Engineering Data Books without obligation.

Name..... Title.....

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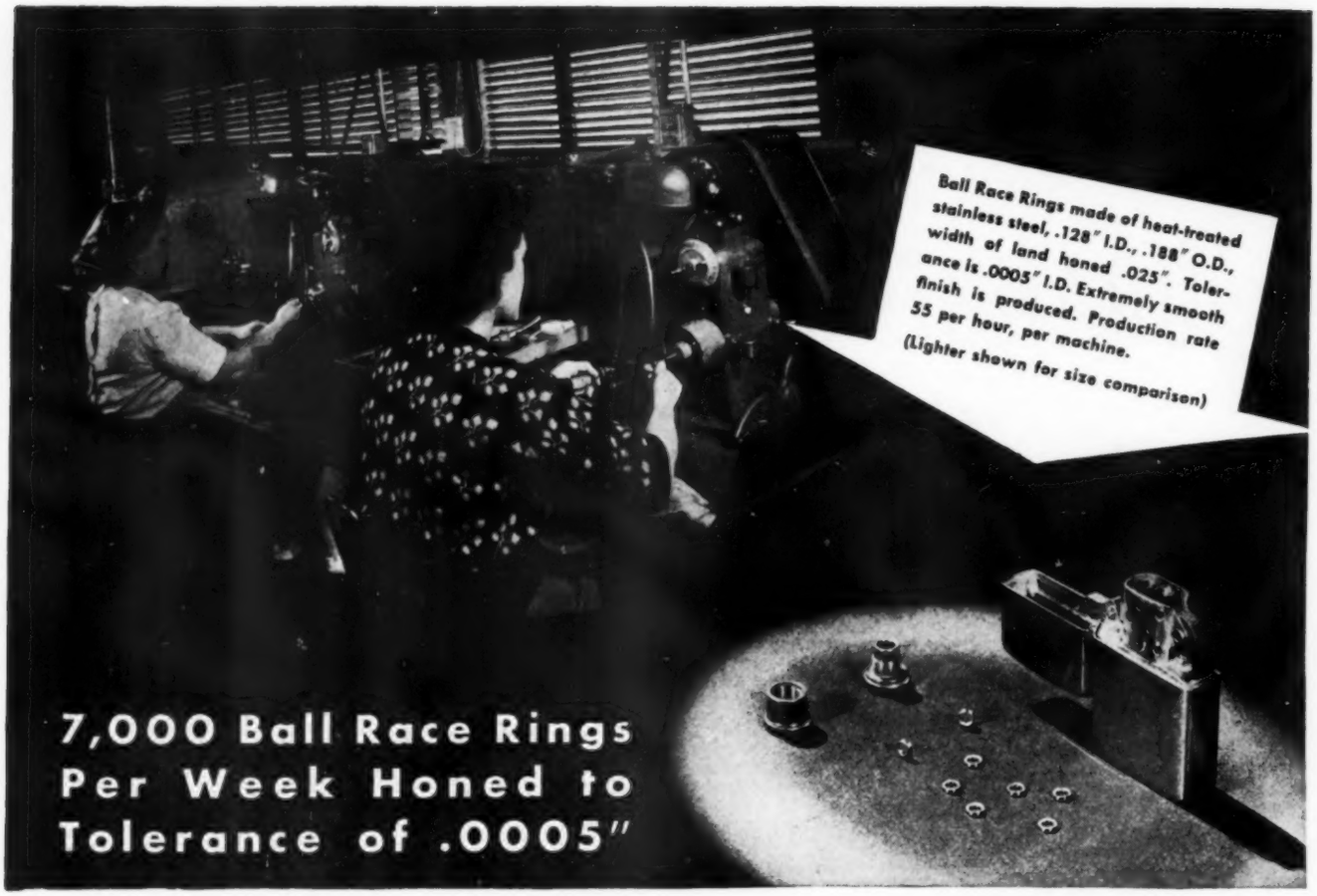

Ball Race Rings made of heat-treated stainless steel, .128" I.D., .188" O.D., width of land honed .025". Tolerance is .0005" I.D. Extremely smooth finish is produced. Production rate 55 per hour, per machine.
(Lighter shown for size comparisen)
7,000 Ball Race Rings Per Week Honed to Tolerance of .0005"

on 2 SUNNEN PRECISION HONING MACHINES ... At Sangamo Electric Company, Springfield, Ill.

"Precision In Miniature" at Sangamo is demonstrated by this ingenious application of Sunnen Honing.

The tiny ball race rings are too small to be held — even in the nimble fingers of the girls who operate these honing machines. The solution was found — and production was increased — by using small fixtures such as the one shown above.

Eight parts are loaded into each fixture — and all are honed at one time. Sunnen Honing at Sangamo has increased production and reduced rejects — in addition to solving a very difficult production problem.

Here are a few reasons why you may profit by using Sunnen Honing Machines in your plant:

- ACCURACY GUARANTEED TO .0001"— Corrects out-of-roundness and distortion. Produces straight round holes.
- HANDLES WIDE RANGE — Hones any hole from .120" to 2.625" in diameter — either blind or open holes — also parts with keyways.
- HONES MOST MATERIALS — Steel, cast iron, bronze, brass, aluminum, copper, plastics, ceramics, glass.
- PRODUCES SMOOTH FINISH — Hones to any micro-inch finish required — no high spots, chatter marks or other surface imperfections.

Write for details — or, on request, a Sunnen engineer will call at your plant.

SUNNEN

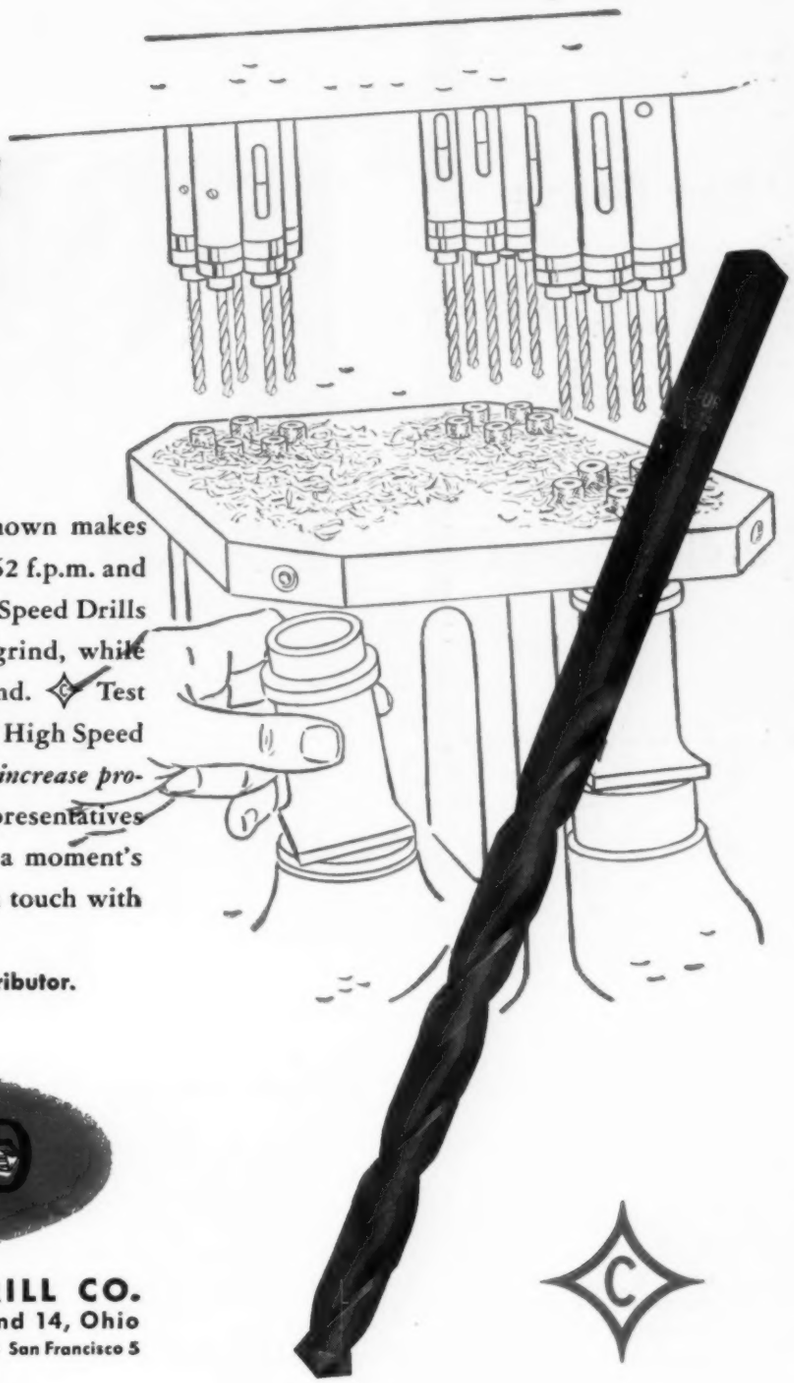
SUNNEN PRODUCTS COMPANY • 7941 Manchester Ave., St. Louis 17, Missouri

Canadian Factory: Chatham, Ontario

327

Test Shows that CLE-FORGE HIGH SPEED DRILLS Give

55% More Holes Per Grind



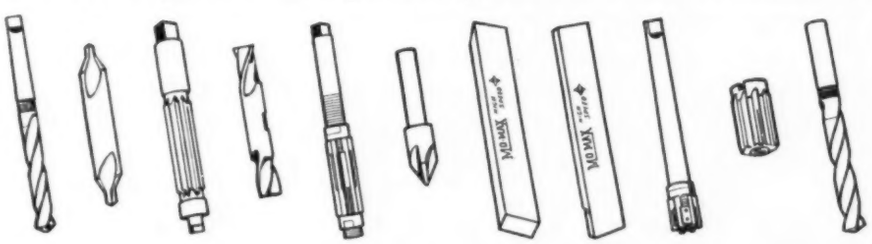
Drill Cost Reduced, Production Increased

An automotive plant tested two well-known makes of drills on a cast iron part, at a speed of 62 f.p.m. and a feed of .0022 f.p.r. CLE-FORGE High Speed Drills produced an average of 124 holes per grind, while the other drills averaged 80 holes per grind. Test after test tells the same story! CLE-FORGE High Speed Drills are engineered to *cut costs* and to *increase production.* CLEVELAND Service Representatives are conveniently located to serve you at a moment's notice, without cost or obligation. Get in touch with our Stockroom nearest you, or . . .

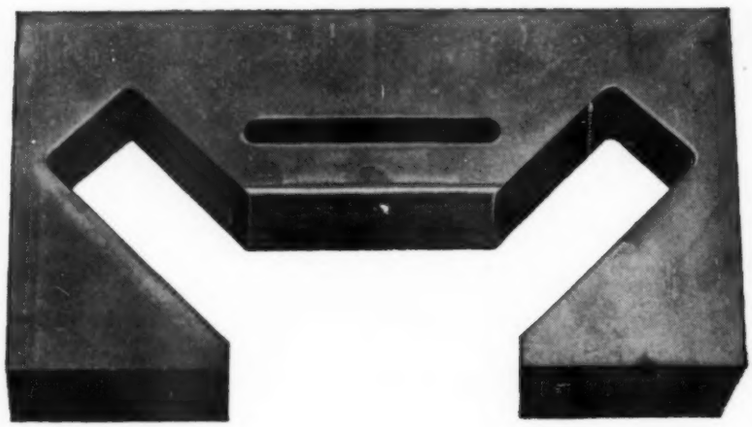
Telephone Your Industrial Supply Distributor.

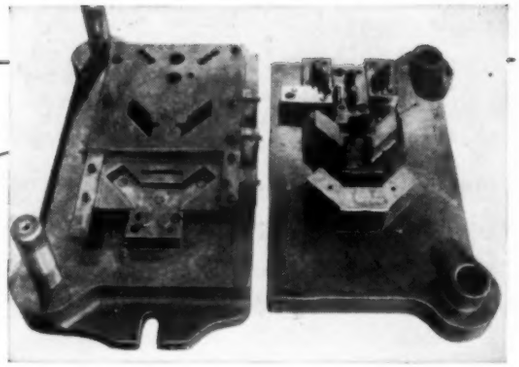
THE CLEVELAND TWIST DRILL CO.
1242 East 49th Street **Cleveland 14, Ohio**
Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 1 • San Francisco 5
Los Angeles 11 • London W. 3, England

ASK YOUR INDUSTRIAL SUPPLY DISTRIBUTOR FOR THESE AND OTHER CLEVELAND TOOLS



How Disston CROLOY was used to solve a die problem





THE PROBLEM . . .

A manufacturer had been experimenting with various alloys to find the one best suited for making the wing die shown above. Specifications called for a finished die of Rockwell C 59/61, without scale and with minimum distortion . . . dimensions had to be held within .002-inch, for no tolerance was allowed for finish grinding.

ANALYSIS:

CARBON	1.50%
CHROMIUM	12.00%
VANADIUM	1.00%
MOLYBDENUM	.80%

DISSTON METALLURGISTS AND ENGINEERS will be glad to help you with your tool steel problems...and without charge or obligation.

STEEL: Everybody who wants to obtain steel can help himself to get it by immediately starting scrap into the channels that serve steel mills.

THE SOLUTION . . .

DISSTON CROLOY AIR HARDENING STEEL

This high quality, many purpose tool steel was designed to give high resistance to sliding and impinging wear, and at the same time combine air hardening properties with reasonable machinability. It has proved to be exceptionally serviceable for tools such as punches, dies, slitting cutters, gauges, brick liner plates, wearing parts and other applications.

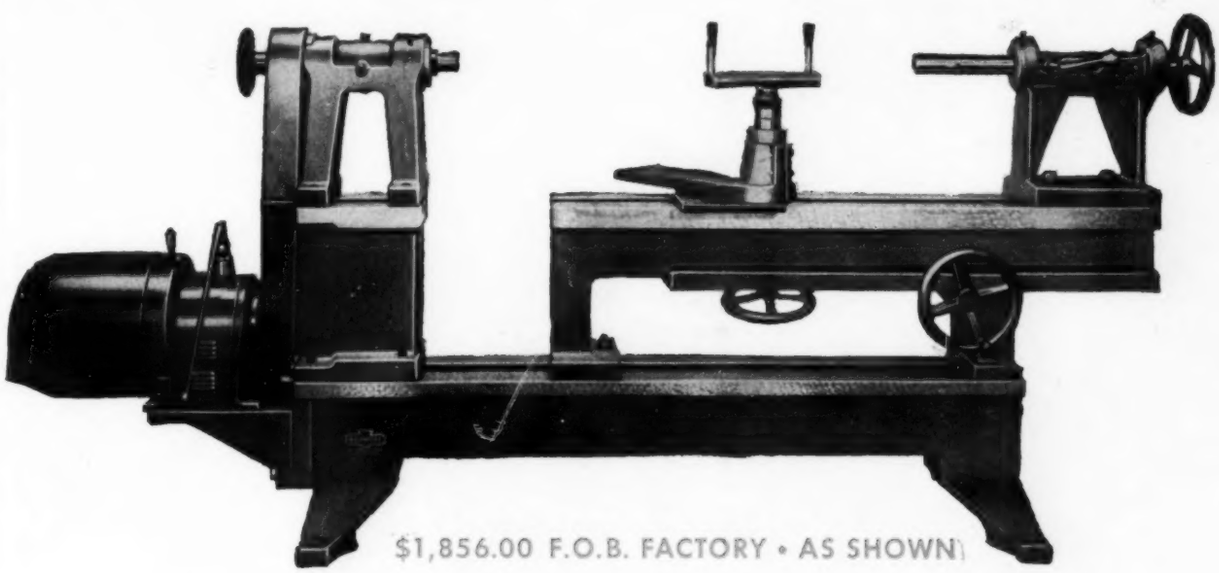
HENRY DISSTON & SONS, INC., 420 Tacony, Philadelphia 35, Pa., U. S. A.

BEDINGER

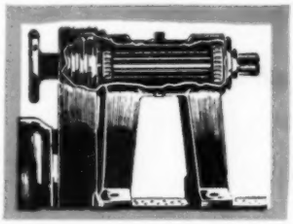
Metal Spinning LATHES

Now AVAILABLE

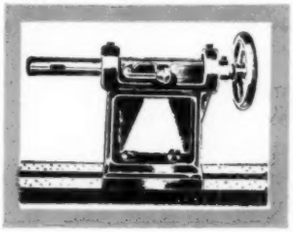
Immediate factory shipment or you may buy off show-room floors of our agents from coast to coast.



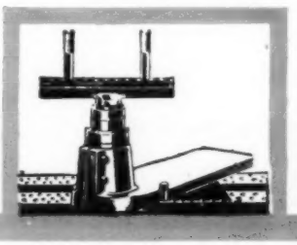
$1,856.00 F.O.B. FACTORY • AS SHOWN



These tapered roller bearings running in oil, precision adjusted to eliminate end-play, will withstand maximum continuous combination thrust load. The *production proved* spindle mount.



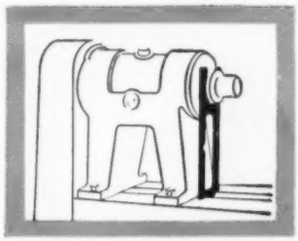
Combination screw tailstock with 4" and 9" fast travel rotary cam safety lock. 2" screw take-up can be used in combination with cam-lock in either 4" or 9" position (Pat. applied for).



Tool-rest. Two 1" spacers and 1" threaded collar on T-rest shank assure positive vertical adjustment. Interlocking serrated collars automatically lock T-rest shank in any position. T-rest cannot turn or slip. (Pat. applied for).

Bedinger 27" lathe converted to 27"x60" Bedinger gap lathe. This converted Bedinger gap lathe is equipped with a 2 speed 5 H. P. 1800/900 R. P. M., 220 volts, 60 cycle, 3 phase, a.c. motor and 4 speed Lima drive, giving 8 spindle speeds. With the 2 speed motor a push of the button changes from low to high or high to low without stopping the spindle. This drive combination with a 1 to 1 speed ratio of the pulleys gives speeds of: High- 1730, 930, 555, and 420 R. P. M. or Low- 850, 460, 270, and 205 R. P. M. Unless requested on the order this ratio is made 1 to 1 at the factory.

Skidded shipping weight motorized: 3600 lbs.



With the Bedinger spindle lock you have *both* hands free to handle the chuck. The Bedinger spindle lock is easy to slip into position and it holds the spindle in a locked position until it is removed by the operator.

BEDINGER PRECISION CO.
566 West Avenue 26
Los Angeles 31, California

CApitol 4591

Please send me complete information as to price, specifications and delivery date on a Bedinger lathe. I am interested in a

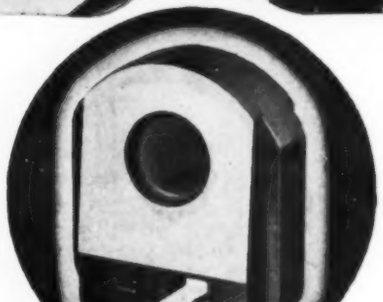
- ☐ Super Duty Spinning Center
- ☐ 18" straight bed
- ☐ 27" straight bed convertible
- ☐ 27" x 60" gap bed

Firm Name _____

Title _____

Street _____

City and State _____



Write for Free Set-Up Book showing how others have reduced time and cut costs with Mattison Grinders.

Assembled Without Gasket

TO WITHSTAND 600 LB. PRESSURE

Users of Mattison Grinders, having parts which must be assembled without gaskets, are getting results in accuracy and fine finish that eliminate the lapping operation in most cases. One example is the gate valve disc shown in the picture.

They are ground on a real production basis — 100% increase over previous method to a close degree of accuracy and are assembled wlthout the use of gaskets to withstand pressures up to 600 lbs. There is no lapping operation. Material is Exelloy 325 Brinell.

This is only one example showing the capability of the Mattison Grinder. Further examples are shown in the Mattison Set-Up Book.

MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS

ANY WAY YOU LOOK AT IT . . . FEDERAL NOARK Motor Starters cut maintenance costs!

Friction
enemy of smooth operation
it can't happen here
BULLETIN 504, 3 POLE, SIZE 2 TYPE FORM
MAGNETIC A.C. MOTOR STARTER CAT NO

BALL BEARING ACTION insures smooth operation, prevents failures in the Federal NOARK Motor Starters. The only moving part, a solenoid, rides on *ball bearings*—right where they count! Mechanical trouble can't develop . . . breakdowns can't happen!

Instantaneous choice of manual or automatic *positive* reset.

Plus

- **Simplified RESPONSIVE ELEMENT**
- **Immediate CONTACT RENEWAL**
- **Instant COIL REPLACEMENT**

Federal NOARK *Motor Starters*

Executive Offices 50 Paris Street, Newark 5, N. J
Plants: Hartford, Conn., Newark, N. J.,
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SALES OFFICES IN PRINCIPAL CITIES

Federal Electric Products Company, Manufacturers of a Complete Line of Electrical Products including Motor Controls • Safety Switches Service Equipment • Circuit Breakers • Panelboards • Switchboards • Bus Duct

The Most Satisfactory Means of *Purifying* CUTTING OIL

Purification of cutting oil by De Laval Oil Purifiers is a profitable salvage and maintenance operation. By centrifugal force, these machines restore cutting oil to usable condition. In itself, this is an excellent means of saving money. But even more important than the oil economies effected are the production advantages of having plenty of cutting oil available, absolutely free of metallic impurities. These advantages include longer tool life, higher permissible cutting speeds and minimized wear on moving parts of cutting tools.

There are many other applications for De Laval centrifugal machines in most metal-working plants. For example, De Laval purification of hydraulic oils lengthens the life of the pumps used for maintaining the necessarily high pressures in the hydraulic cylinders, and minimizes danger of pilot mechanism sticking.

● **Write for Bulletin MM-1 and check the applications in your own plant.**

De Laval

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

PURIFIERS AND CLARIFIERS FOR FACTORY OILS

Avey's PLUS features

add up to TOP PRODUCTION

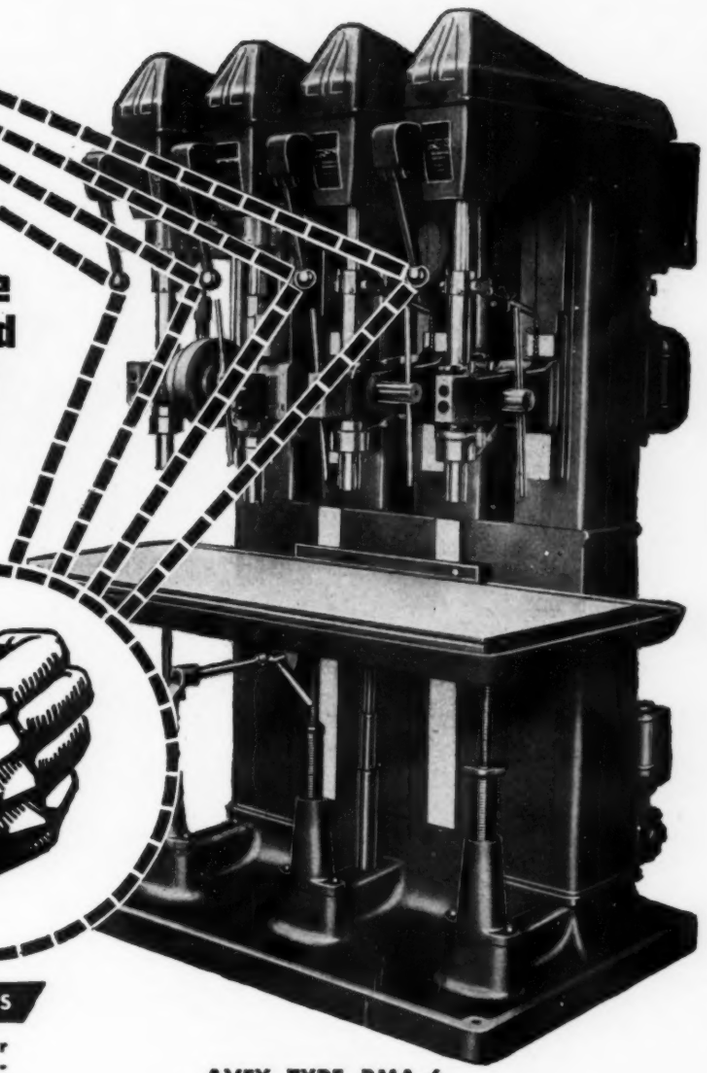
Six speed changes on the AVEY BMA-6 are made through selective, sliding gears. This automotive type of gear shift is controlled by a single lever at front of machine. Provides versatility and effective operation.

CAPACITY
Cast-Iron

‡2 BMA 6-⅞"

‡3 BMA 6-1¼"

Single to six spindle machines, equipped with hand feed, power feed or reversing motor tapping.



AVEY TYPE BMA-6

Four Spindle—12" Overhang

1st spindle—Avey-matic feed
2nd spindle—Plain power feed
3rd spindle—Hand Feed
4th spindle—Tapping (reversing motor)

plus **FINAL SPINDLE DRIVE—VEE BELTS**

Vee belt used on final drive from gear box to spindle. Increases speed and sensitivity in drilling. Carries full horse power from motor to job.

plus **STANDARD MOTOR — EACH SPINDLE**

Each spindle of AVEY BMA-6 individually motor-driven by standard frame constant speed motor. Foot-mounted motor easily interchanged or replaced. Standard motors can be stocked.

plus **SPEEDS OBTAINED — SLIDING GEARS**

Selective, sliding gears of AVEY BMA-6 change speeds quickly and easily. Each gear is manufactured and finished by accurate, modern process, shaved, hardened and lapped. Insures smooth operation and long performance.

CLIP AND MAIL TODAY

AVEY DRILLING MACHINES
CINCINNATI, OHIO

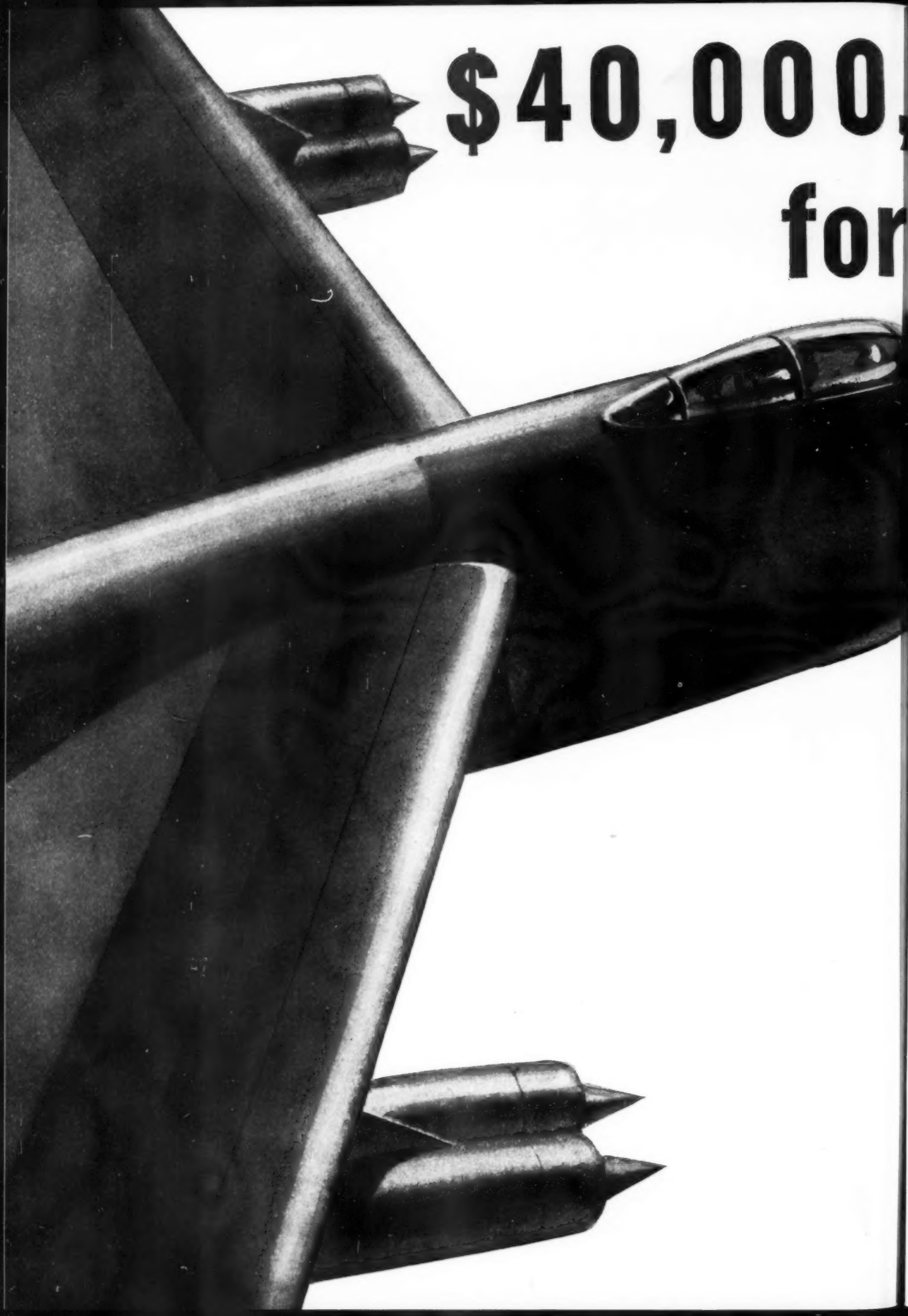
AVEY DRILLING MACHINE CO., "1"
CINCINNATI 1, OHIO

Gentlemen: Please send without obligation your new Bulletin 647.

COMPANY_____

ADDRESS_____

NAME_____


$40,000,
for A

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r Aviation by 1952

JANUARY 1, 1948 — **"We need a greatly enlarged air force, right now."** — *President's Air Policy Commission*

FEBRUARY 9, 1948 — **"U. S. policies must remain continually adjusted to the requirements of total air power."** — *Air Coordinating Committee*

MARCH 1, 1948 — **"We must have air power that is supreme. We cannot have less."** — *Congressional Aviation Policy Board*

FORTY BILLION DOLLARS . . . that's the amount of money required to rebuild U. S. air supremacy in the next five years. Our Administration, our Congress, our military and aviation leaders agree that we must do this if America, as the leading world power, is to maintain world peace and order.

Nor can we stop there. We must continue to spend, say our national leaders, $10 billion yearly to maintain this air supremacy.

One of America's greatest industries

"The air power we must have presages a vast new industry." These are the words of the Congressional Aviation Policy Board. Aviation will again become one of the largest of U. S. industries — larger than the giant automotive industry.

What this will mean to your business

The impact of $40 billion of aviation spending will affect every business in this country. Your planning, beginning now, must embrace the effect on your business of the innumerable product and service requirements of aviation.

The sales approach to the Aviation Market

Aviation is *one* industry, not many. As the Congressional Board expresses it, "National air power is an entity not fundamentally divisible as a weapon or as a carrier." Air power is the total aviation activity—military, commercial and private. This is the key to your aviation sales job.

How *Aviation Week* serves your sales requirements

Aviation Week was specifically designed to serve the information needs of *all* men in the aviation business. Its editors report every important development in the science of aeronautics and assess its effect upon all activities within the industry. Its editors also recognize the need for the greatest possible speed in the communication of aeronautical intelligence.

Aviation men must get all the news—and the meaning of the news—and they must get it fast. *Aviation Week* is the one aeronautical publication geared to match the need and the speed of aviation.

In the development of your marketing plans to serve this great U. S. industry, we submit *Aviation Week* as the most powerful single sales influence you could place behind your product.

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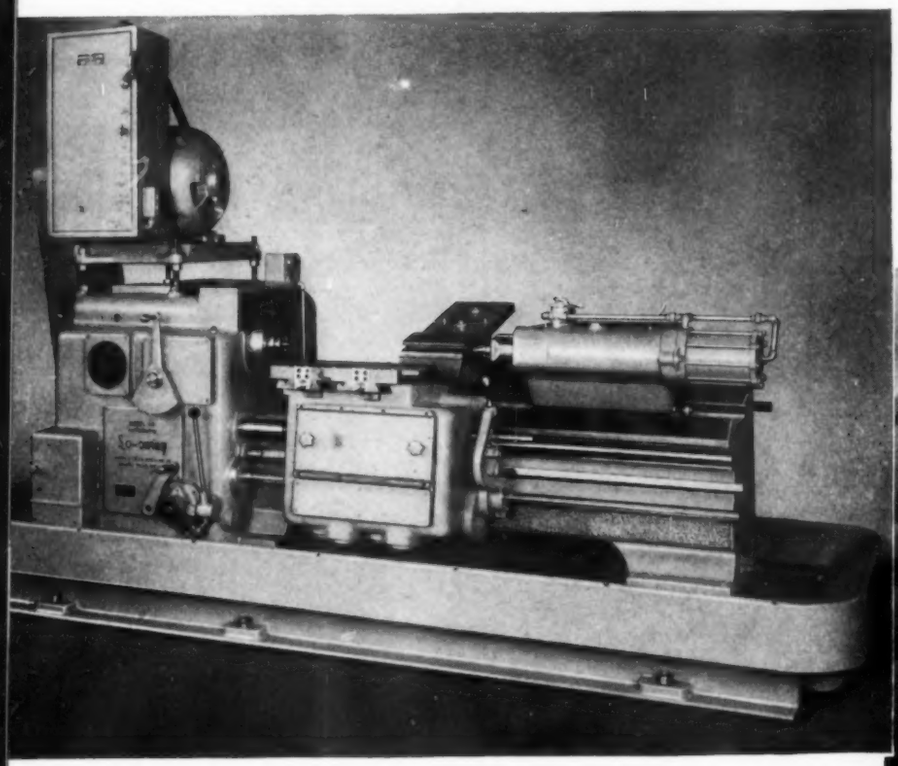
ABP **AVIATION WEEK** ABC

THE MAGAZINE OF AVIATION BUSINESS

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. **"THE Lo-swing PEOPLE"** SENECA FALLS, NEW YORK



Front view of machine without tooling.

Close-up view showing tooling.

Lo-swing MODEL AR LATHE EQUIPPED FOR TURNING DIESEL MOTOR PISTONS

Problem: To automatically turn, groove and face special alloy pistons having a maximum diameter of 8".

Solution: The Model AR Lo-swing was selected for this job due to its rigidity and "Simplified Change-over Mechanism" which permits changing over from one size piston to another in a few minutes by simply making a few adjustments in gear segments and cam which controls cross slide and rapid traverse movements.

The work is centered on the driven end with an adapter plate machined to fit the bore of the open end of the piston which has been previously machined. This adapter is fitted with a hardened steel driving plate which contacts a lug cast on the inside piston wall, assuring a positive drive. The piston is supported on the tailstock end with a standard 60° revolving type center.

The turning operation consists of machining the outside diameters with four tools mounted on a single cross slide. The grooving and facing tools are clamped on two independently operated Back Squaring Attachments, the movements of which are synchronized with the front slide.

The end facing tool is mounted in a special relieving type tool block (see close-up view) which automatically relieves the tool on the return stroke, preventing any scoring or marking of the finished face.

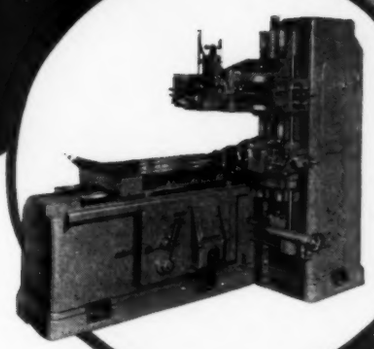
Sintered carbide tools are used on this job and a high grade finish is obtained on the ring grooves.

Seneca Falls Engineers are always at your disposal to help find cost cutting solutions for your turning problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH Lo-swing

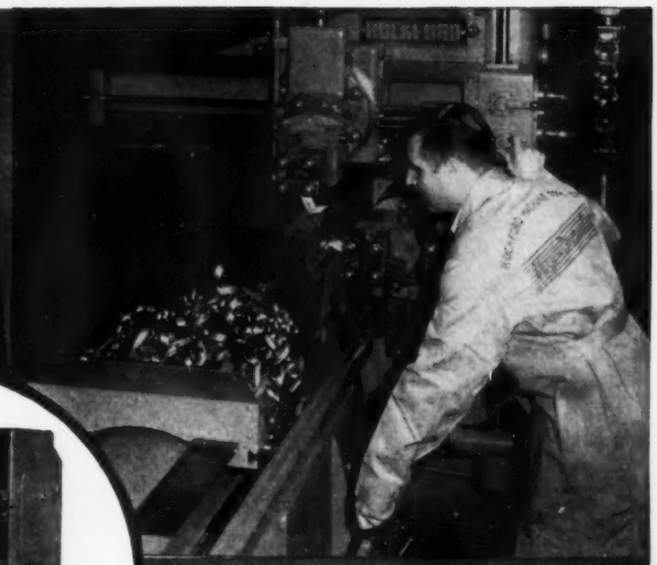
Complete REDESIGN



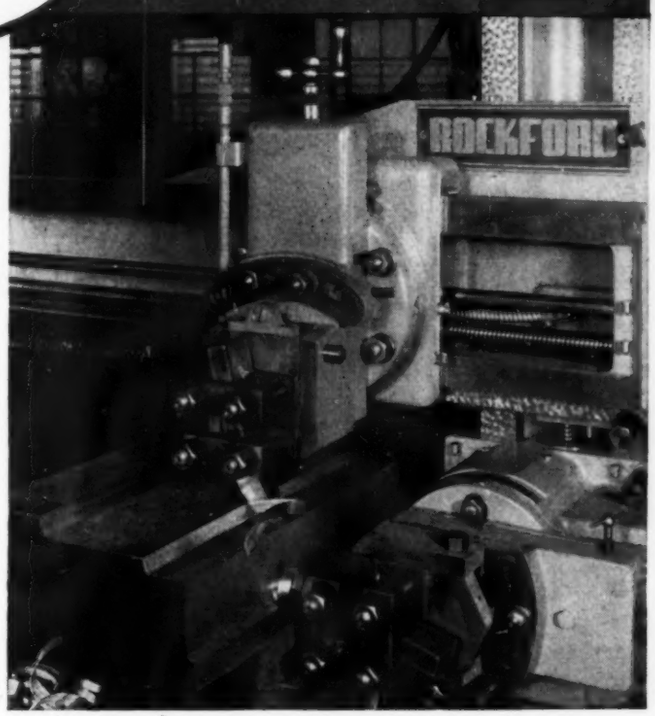
for

- **increased range of application**
- **easier set-up and operation . . .**

The redesigned Rockford Hy-Draulic 36″ Openside Shaper offers two important new advantages: (1) Range of application is greater due to the new heavier Column and Rail, and the new redesigned Side Head . . . and (2) Ease of set-up and operation is improved because of such features as dual controls for table operation from either side of table. As extra equipment power rail elevation is available to further simplify set-up work. All the other advantages typical of any Rockford Hy-Draulic machine are provided by the new 36″ Openside Shaper . . . such as fast cutting and return strokes with infinite speed selection between wide range low and high.



THE NEW ROCKFORD *Hy-Draulic* 36″ OPENSIDE SHAPER



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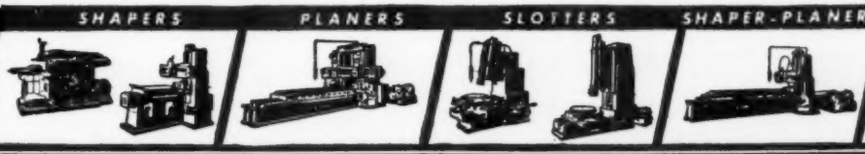
Let a Rockford Hy-Draulic sales engineer give you the point-for-point story of the new Rockford Hy-Draulic 36″ Openside Shaper advantages. *See for yourself . . . or write for Bulletin 4441.*

ROCKFORD MACHINE TOOL CO.
ROCKFORD ILLINOIS

Hy-Draulic
REG. U. S. PAT. OFF.

SHAPERS PLANERS SLOTTERS SHAPER-PLANERS



BUCKEYE "Lubrico"

...The Exceptional Quality High Lead Bearings That Pay Users Back Over and Over Again

Buckeye "Lubrico" Bearings combine reduced coefficient of friction, excellent conformity to overcome slight shaft misalignments, the ability to withstand heavy shocks without cracking, and extremely desirable qualities of self-lubrication.

They minimize the chances of freeze-ups and breakdowns,—yet cost little more than bearings of standard analysis.

Furnished in any I.D. or O.D. and length,—slotted, drilled, flanged or threaded to meet any requirement.

Let us quote on your requirements.

Buckeye

BRASS AND MANUFACTURING COMPANY

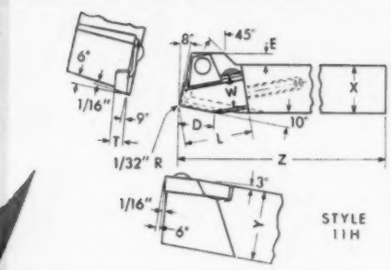
BRONZESMITHS SINCE 1900

6412 HAWTHORNE AVE. CLEVELAND 3, OHIO

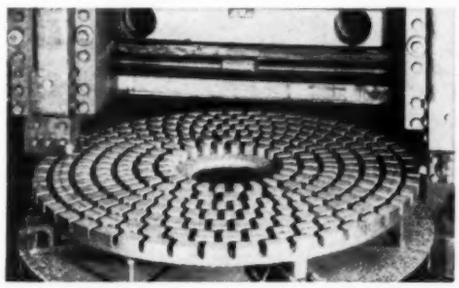
BRONZE SLEEVE BEARINGS • STANDARD SIZES OR TO CUSTOMERS' BLUEPRINT IN ANY RECOGNIZED BEARING METAL ANALYSIS

IF Interrupted Cuts Are Your Problem

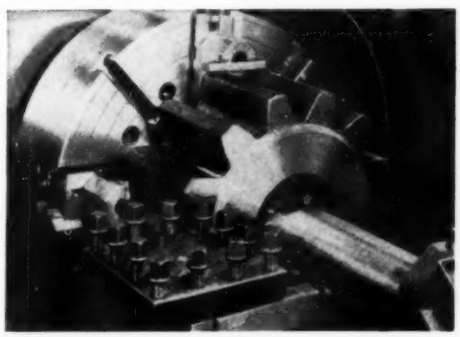
Learn About Kennametal



Style 11H is one of a complete line of Kennametal tools, having sturdy, clamped-in, advanceable Kennametal tips. This assembly—developed by Kennametal—is highly successful on interrupted cutting, and is equally outstanding on continuous-cut operations. It utilizes Kennametal's high strength to best advantage—provides a thermally-strain-free assembly; makes possible deep cuts and heavy feeds; simplifies grinding since tip is advanced and re-sharpened without removing any steel from shank; and enables practically all of the Kennametal tip to be utilized for cutting.



This iron casting has 288 chilled lump interruptions. A Kennametal standard Style 11T80 tool faces and turns it at 190 ft./min., .048" feed, and ¼" depth of cut.



Kennametal bores, turns, and faces over interruptions and sand holes on this chrome-nickel steel rack pinion. Speed—155 ft./min.; feed—.032"; depth of cut—¼" to 5/16". Performance is 5 to 1 over high speed steel tools in production and pieces per grind.

You're probably enjoying the advantages of carbide tooling on continuous-cut operations—but how about interrupted cutting?

Has this given you tool trouble, and made you resort to slower machining methods on some important jobs?

If so, Kennametal will help you solve this problem. Its ability to withstand the shock of interrupted cuts, on both cast iron and steel, has been unequalled.*

Although cutting conditions are often improved by changing the tool shape so that the shock will be imposed on a section of the tip that is stronger and better supported, it is still the carbide that must take the punishment. Here's where Kennametal has a distinct advantage.

Because of exclusive processing methods and careful control in manufacture Kennametal's impact strength is unusually high for such a hard material—as great as that of hardened alloy steels having much lower hardness and compressive strength.

Still further advantages for interrupted cutting are obtained by the use of mechanically-held tools developed by Kennametal Inc. Tips of characteristically high impact strength are securely clamped to, and firmly supported by a heat-treated steel shank, to provide an exceptionally strong strain-free assembly.

If you have had difficulty with carbide tools on interrupted cuts, let us engineer Kennametal to the solution of your particular problem.

**Ask us to send you a set of Performance Reports that demonstrate the superior results obtained with Kennametal Tools on interrupted cutting.*

KENNAMETAL Inc.

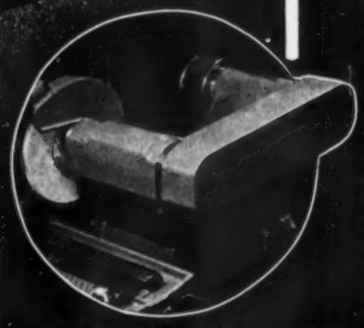
Trade Mark Reg. U. S. Pat. Off.

LATROBE, PA.

MANUFACTURERS OF SUPERIOR CEMENTED CARBIDES AND CUTTING TOOLS THAT INCREASE PRODUCTION

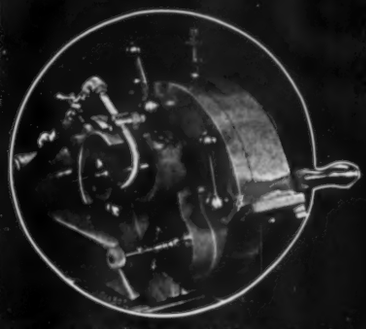
Designed for EFFICIENCY

TO PRODUCE MORE OF A GREATER VARIETY THRU EASE OF PRECISION SET UP AND OPERATION



External Bracket

The Rivett No. 104 is a simple, power-driven grinder suitable for tool making and precision manufacturing. Operations of widely varying nature can be quickly set-up and efficiently ground on one or many pieces. Interchangeable brackets are selectively mounted on the cross slide for internal, external, or concentric grinding in straight, taper, face or shoulder form.



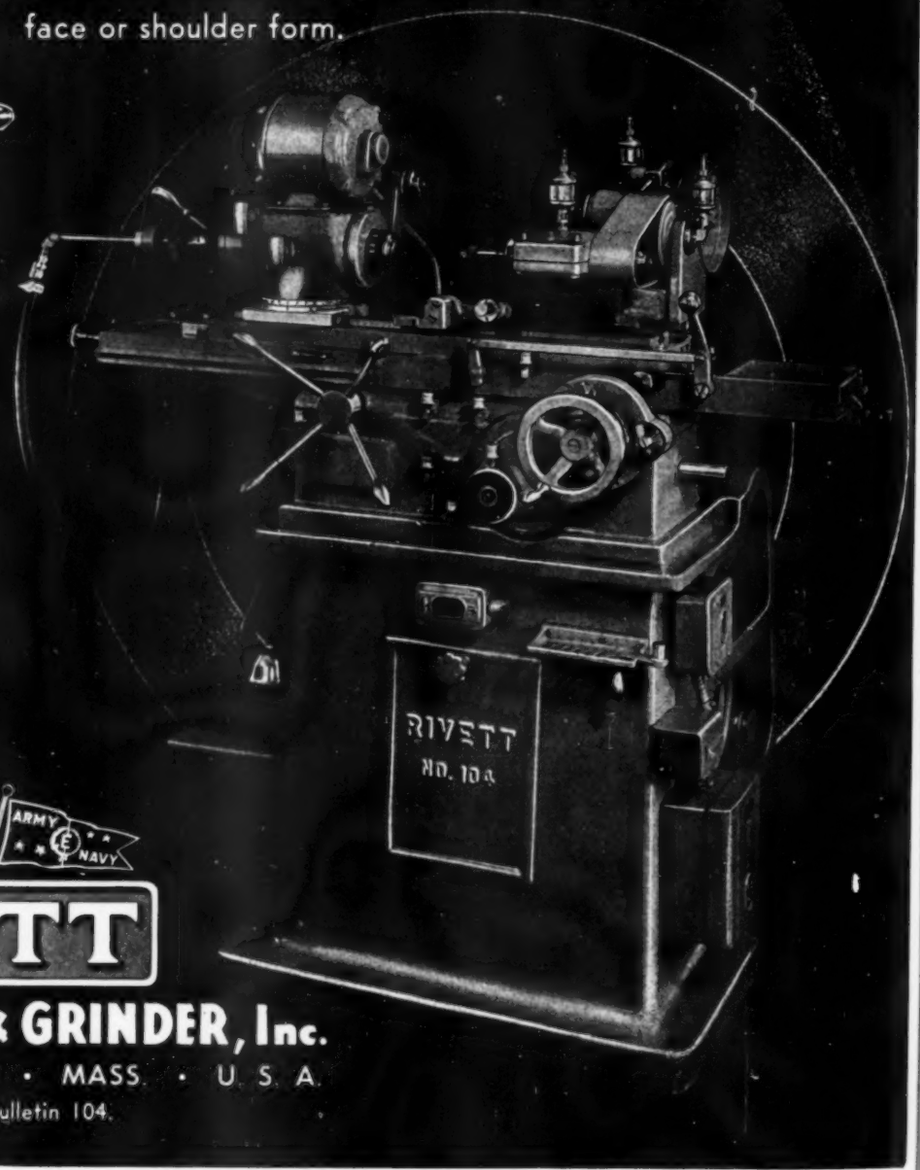
Internal, External Turret

RANGE

Internal spindles of suitable design and speed may be selected for hole grinding up to approximately 3" diameter and 4" length.

External bracket with 7" x ½" wheel may be used for on-center or chucked work up to approximately 3" diameter.

Turret for concentric grinding of hole or outside surface is limited to such work as may be chucked.



ARMY E NAVY

RIVETT

RIVETT LATHE & GRINDER, Inc.

BRIGHTON · BOSTON · MASS. · U. S. A.

Write for Bulletin 104.

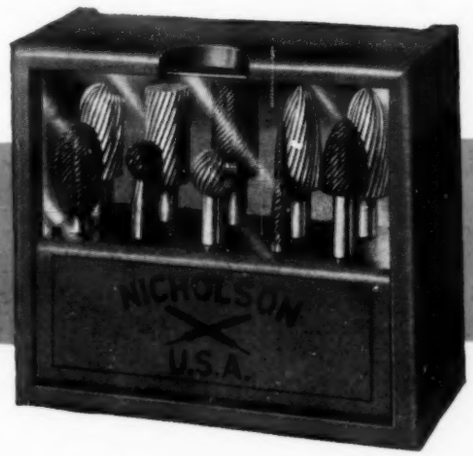
THE ROTARIES for

FAST CUTTING
PERFECT BALANCE
LONG LIFE

Whether you buy them in kit assortments or in specified quantities per type, size and cut (coarseness), Nicholson Rotary Files and Ground-from-solid Burs carry the same assurance of efficient and economical performance as the Nicholson hand files which for years have been marketed under the guarantee of *Twelve perfect files in every dozen.*

Nicholson Rotaries are of the highest standards — in precision design, in exacting workmanship, and in long-wearing hardness and toughness.

Your industrial distributor can supply you and give you helpful assistance in selecting *The right file for the job* from among Nicholson lines briefly described below. Detailed catalog sheets and prices are available.



VARIOUS ASSORTMENTS AVAILABLE

#40 5 Burs 5 Files

#88 18 Burs

HIGH SPEED STEEL—¼" SHANK—*Hand Cut Rotary Files*—principally for ferrous metals and other hard materials—in 16 standard shapes and 3 degrees of coarseness.

***Ground-from-solid Burs*—**principally for non-ferrous metals and other soft materials—in 16 standard shapes and 3 degrees of coarseness.

CARBIDE—¼" SHANK—*Ground Bur* type only—in 9 standard shapes and 3 degrees of coarseness. With up to 100 times the wearing qualities of high speed steel, Carbide Burs are ideal for long production runs.

HIGH SPEED STEEL—⅛" SHANK—*Hand Cut Rotary Files* and *Ground-from-solid Burs*— each in 18 standard shapes similar to ¼"-shank line and one degree of coarseness. For relatively delicate work.

• • •

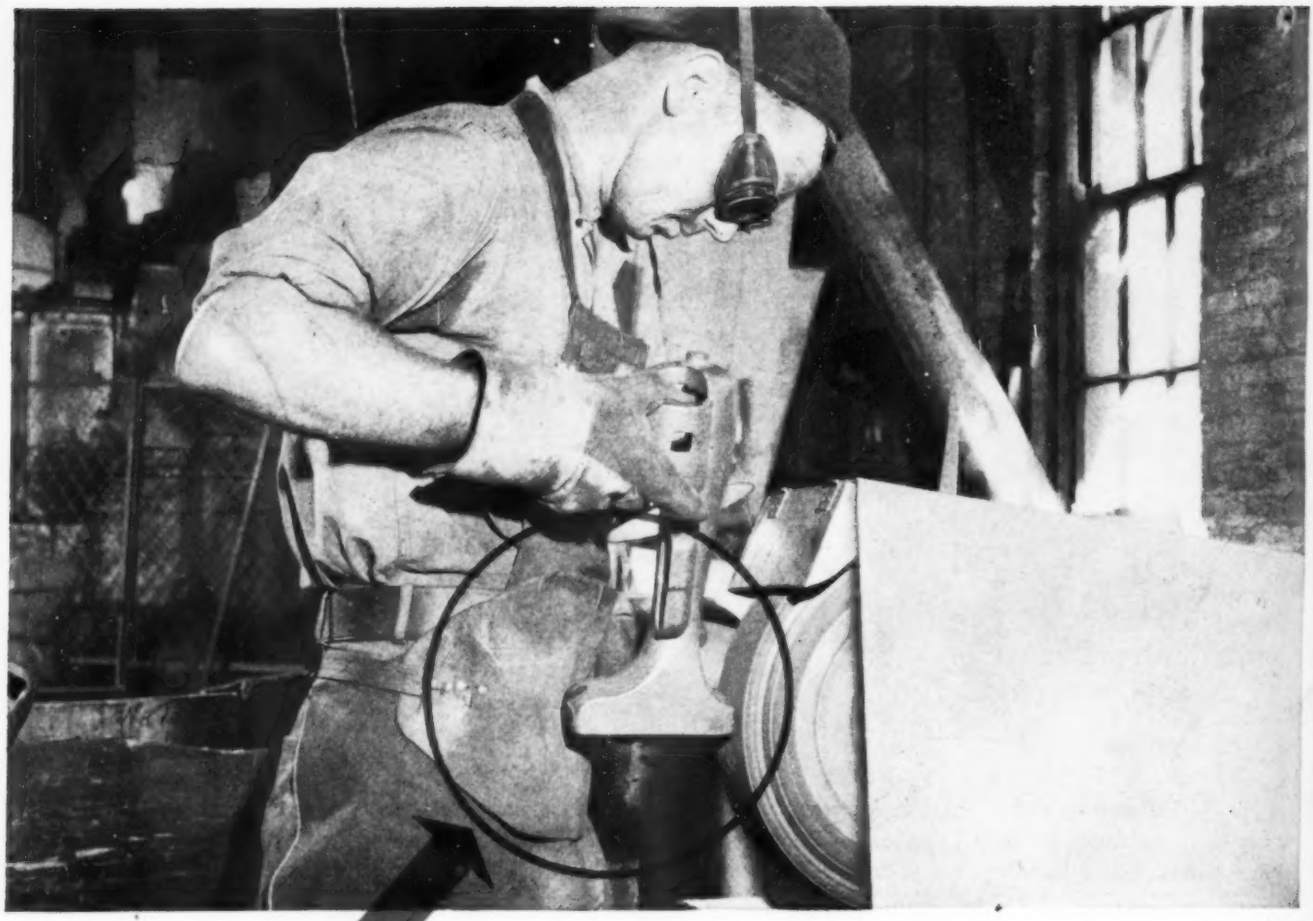
NICHOLSON FILE COMPANY, 97 Acorn Street, Providence 1, Rhode Island

(In Canada, Port Hope, Ont.)

NICHOLSON ROTARY FILES NICHOLSON U.S.A.

PRECISION GROUND AND HAND CUT **HIGH SPEED STEEL AND CARBIDE**

TANGENTIAL PRESSURE FROM DRIVING GEAR



Production time cut 74%!

This sewing machine manufacturer formerly used hand filing to remove flash on sewing machine arms and beds. Switching to floor backstands with segment face contact wheels and 3M Abrasive Cloth Belts cut production time on each arm and bed from 12 minutes to 3 minutes, 5 seconds.

This method makes production-line grinding and polishing possible on a wider range of surfaces than ever before, producing uniform finishes at a lower cost per unit in every case.

3M ABRASIVE BACKSTAND BELTS CAN HELP *YOU* REDUCE COSTS

More and more manufacturers are switching to 3M Backstand Belts because of their faster cutting and smoother finishes—regardless of whether surfaces to be finished are curved or flat! Lowered production time, increased output, and fewer rejections are combined with long, economical belt life to produce new savings and a new quality of output.

Further information can be had from your local jobber, or use the coupon below for your free copy of our booklet explaining the 3M Backstand Method.

Please send us a copy of your booklet. AM-448

By.....

Firm.....

Address.....

City.....Zone....State.....

3M ABRASIVE BELTS

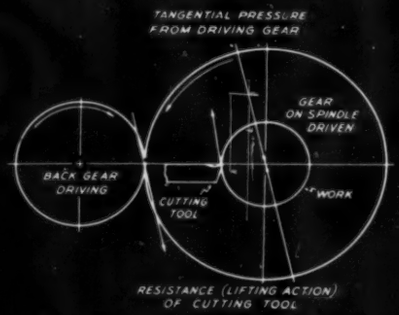
ANOTHER 3M COMPANY PRODUCT

Made in U. S. A. by
MINNESOTA MINING & MFG. CO.
Saint Paul 6, Minn.

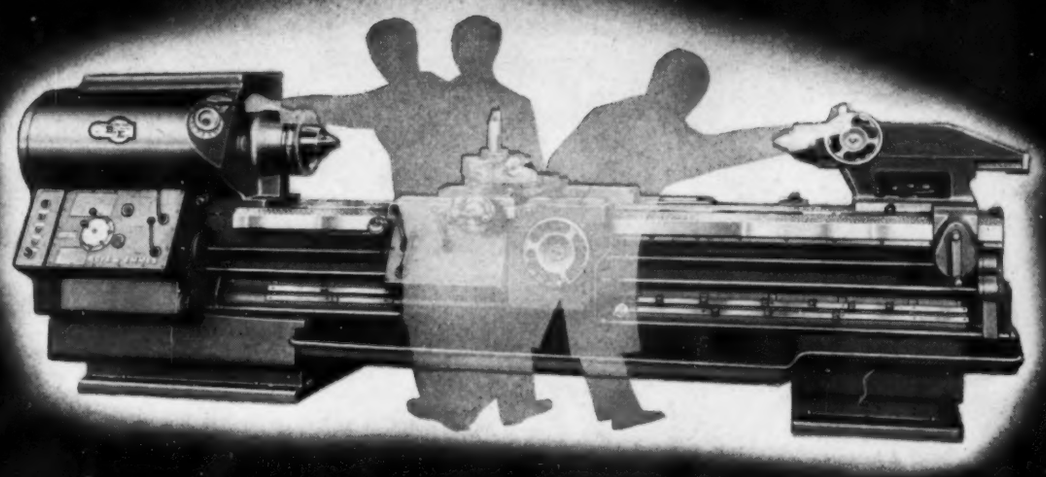
It has everything

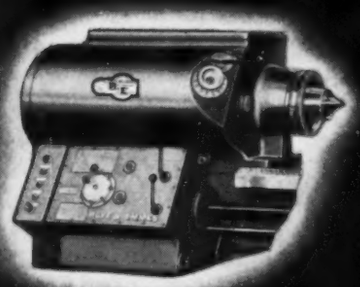
MOST QUIET, VISIBLE, ACCESSIBLE 25 INCH LATHE EVER DESIGNED

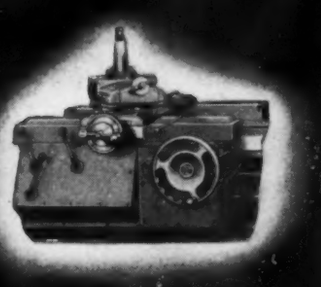
16 SPEEDS 7-500, AND 64 FEEDS



The down pressure of the back gear at the front (see diagram) counteracts the upward lift of the tool, eliminating chatter inherent in lathes which have a *double* lift on the spindle — by the tool on one side and back gear on the opposite side.







Imagine! Speed and feed dials can be read by operator or foreman standing 15 feet to the left. Speed and feed tables are read without squat, squint, or stoop, and controls are more accessible because gear box has been sloped.

Sloped apron makes controls more accessible. Hand wheel is easier operated by right hand. Large dials are direct reading. Compound rest dial is mounted at an angle preventing interference with cross feed handle.

Tailstock slide adjusting handwheel travels with center and is in easy reach. When carriage is near center of bed all operating controls can be reached with a single step in either direction saving the operator lots of effort in a day's time.

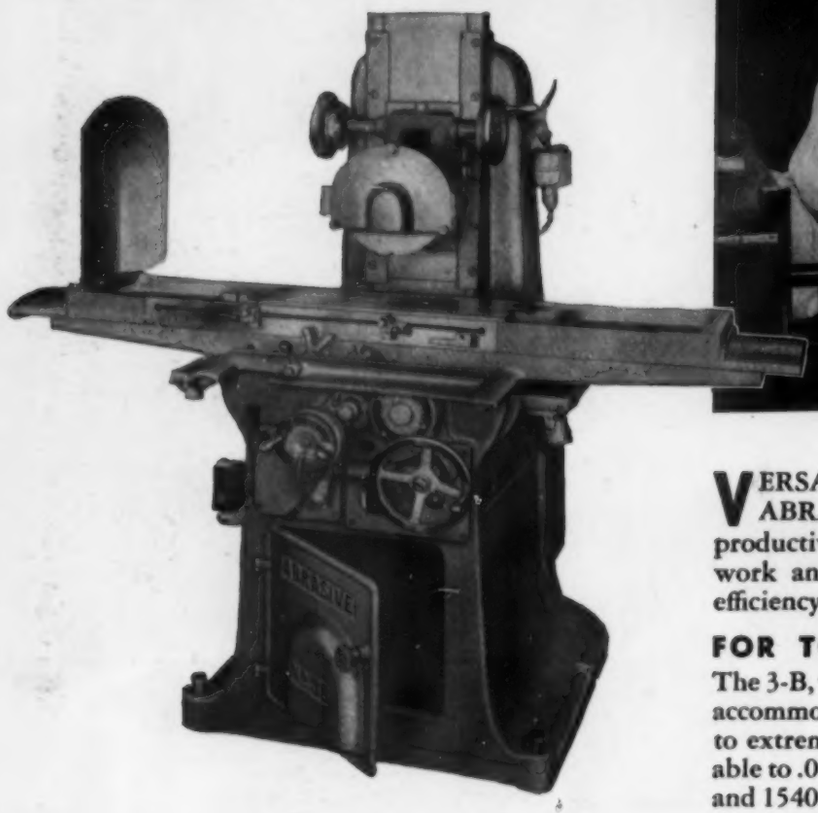
BOYÉ & EMMES

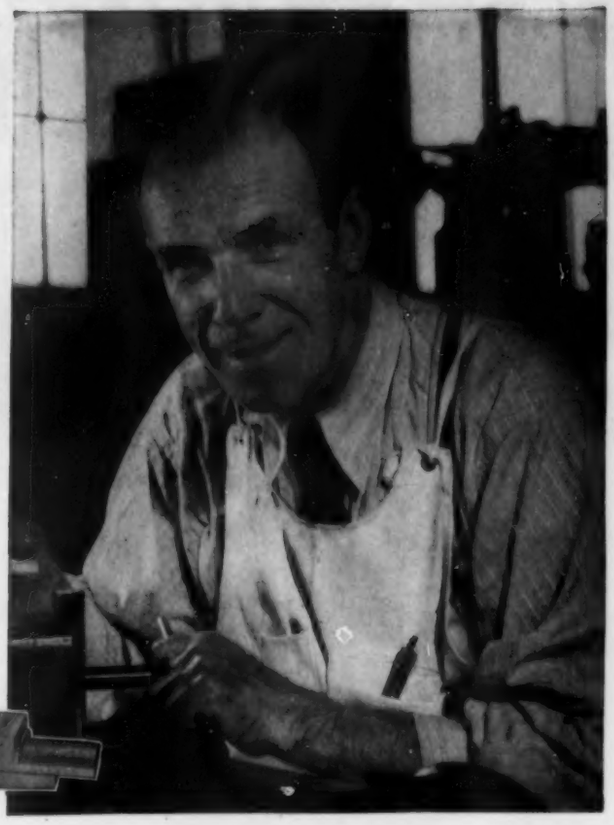
MACHINE TOOL COMPANY

117 Caldwell Dr., Cincinnati 15, Ohio

You'll need this bulletin. Please write on your firm letterhead.

"THERE'S ALWAYS A JOB FOR THE 3-B"





VERSATILITY is an important feature of the ABRASIVE 3-B Surface Grinder. This highly productive machine turns out precision tool room work and special one-time jobs with the same efficiency as it handles long-run production jobs.

FOR TOOL ROOM WORK

The 3-B, with 12" clearance under grinding wheel, accommodates bulky jigs and fixtures. It grinds to extremely close limits . . . vertical feed adjustable to .0001" for finest gauge work. Massive head and 1540 lb. one-piece bed casting minimize vibration. Dust protection throughout provided by metal guards. All controls conveniently centered for manual operation.

FOR LONG-RUN JOBS

Rugged construction and ample power allow heavy cuts. Fast, automatic table feeds — 20 and 40 ft. per minute — and hydraulic shock absorber to cushion table reversal, help maintain heavy production schedules. Cartridge-type oversize spindle of alloy steel (1⅜" diam.) stands up in continuous operation. Top performance and long life are built into the 3-B.

SPECIFICATIONS

WORK CAPACITY:
24" long
8" wide
12" high

SPINDLE:
2290 R.P.M.
Cartridge type

DRIVE:
3 H.P. motor

TABLE SIZE OVERALL:
59" x 10½"

WHEEL SIZE:
Standard 10" wheel.
8" or 12" wheels on order.

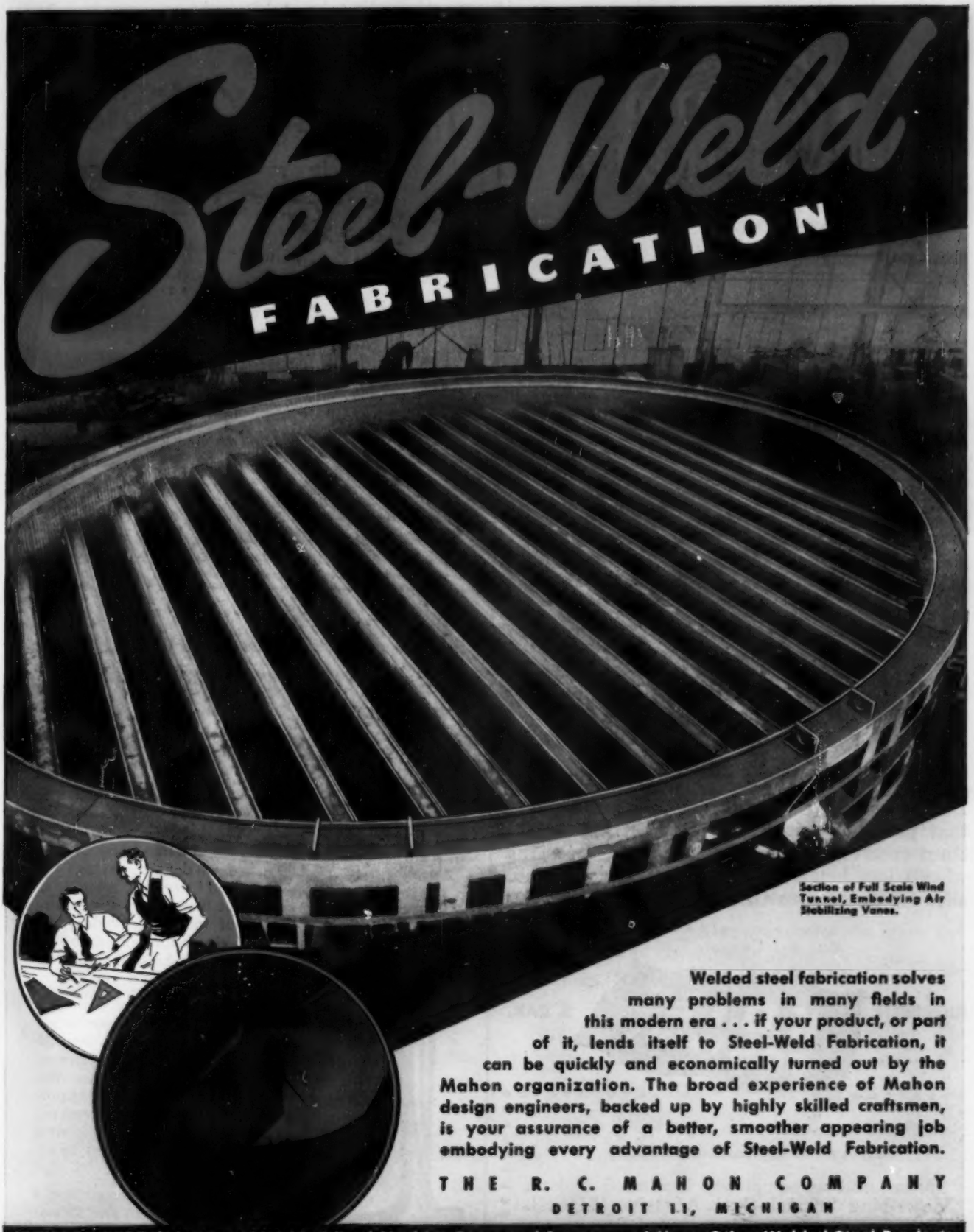
NET WEIGHT:
2670 lbs.

Write for Bulletin

ABRASIVE MACHINE TOOL CO.
East Providence 14, Rhode Island

ABRASIVE
ACCURACY BOOSTS PRODUCTION

Steel-Weld FABRICATION



Section of Full Scale Wind Tunnel, Embodying Air Stabilizing Vanes.

Welded steel fabrication solves many problems in many fields in this modern era . . . if your product, or part of it, lends itself to Steel-Weld Fabrication, it can be quickly and economically turned out by the Mahon organization. The broad experience of Mahon design engineers, backed up by highly skilled craftsmen, is your assurance of a better, smoother appearing job embodying every advantage of Steel-Weld Fabrication.

THE R. C. MAHON COMPANY

DETROIT 11, MICHIGAN

Engineers and Fabricators of Welded Steel Machine Bases and Frames, and Many Other Welded Steel Products

MAHON

HARDENED LUBRICATED HUB and CENTERS Improve Dressing *Cut Repairs*

Abrasive Wheel Dresser

- Special Dressing Wheel dresses wheels any hardness.
- Hardened tool steel hub.
- Hardened tool steel centers —hollow for oiling—adjustable for wear.
- Oil wick—lubricates hub and centers.

Dresses grinding wheels with scrubbing action that produces smoother, faster cutting surface than conventional metal dressers. Dressing wheels last longer, are easier to replace. Four sizes for dressing smallest to largest wheels.

Buy them from your nearest "Knock-Out" Jobber or Mail the Coupon TODAY!

ABERDEEN, **K.O.LEE COMPANY** S. DAK.

K. O. Lee Company
1111 First Ave. S. E., Aberdeen, S. D.

Please send us completely illustrated bulletin describing "Knock-Out" Abrasive WHEEL DRESSERS.

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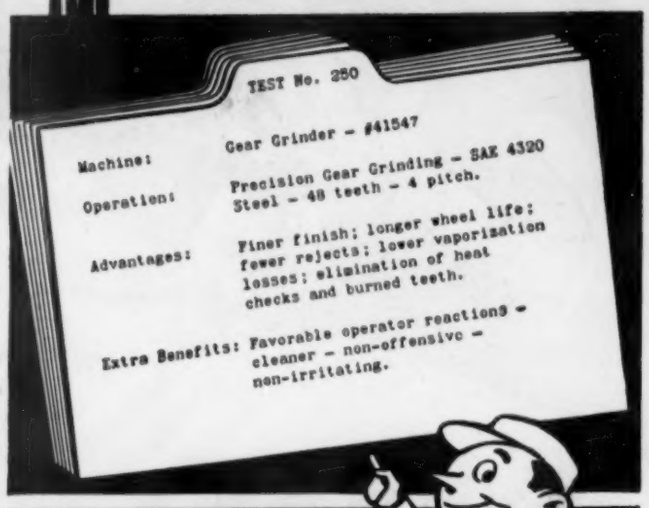
City..... State.....

better results


TEST No. 250
Machine: Gear Grinder - #41547
Operation: Precision Gear Grinding - SAE 4320 Steel - 48 teeth - 4 pitch.
Advantages: Finer finish; longer wheel life; fewer rejects; lower vaporization losses; elimination of heat checks and burned teeth.
Extra Benefits: Favorable operator reactions - cleaner - non-offensive - non-irritating.

fewer rejects...

after Switch to SAFCO I-160 grinding oil

In this case, the use of Safco I-160 Grinding Oil resulted in definite savings by reducing rejects and increasing wheel life. Many similar case histories in the Swan-Finch files tell of increased production, long wheel life, closer tolerances, cooler grinding, smoother finishes—all results of switching to Swan-Finch Grinding Oils.

A visit from a Swan-Finch engineer may show you the way to achieve one or all of these advantages in your plant. Backed by the company's 95 years' experience, he's prepared to make a study of materials, operations and machines used. Based upon that study, he'll recommend the correct oil for each job—the one oil that will serve you best . . . that can be duplicated by no catalog-selected oil.

Take advantage of this technical service. Call in the Swan-Finch man.

INDUSTRIAL PRODUCTS

SWAN-FINCH OIL CORPORATION
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SAVE ½ OR MORE on your carbide tool costs

INCREASE production per tool 3 to 10 TIMES

Another typical job!

Part machined: Rotor Hub
Machine: New Britain-Gridley
Material: Cast Iron (very tough)
Operation: Turning
Depth of cut: .030"
Feed: .020"
Speed: 250 f.p.m.
PIECES PER GRIND: 5700 plus
Best previous carbide: 1800 average (2100 max.)

TECO Grade A-1 used.

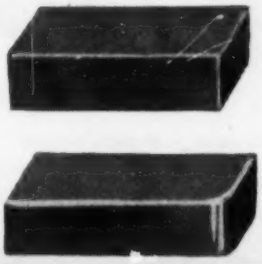
Improved TECO Cemented Carbide is not offered as a "cure-all", nor as the solution to "freak" machining problems.

But—wherever you are running an established, high-production carbide job—turning, boring or facing—you should be able to duplicate the great production increases shown in other plants.

The only way to know, is to tool up a machine with Improved TECO and compare pieces per grind—grinds per tool—tool costs, with your present carbide. Then, run at higher speeds and feeds for an additional surprise.

Send us details of your machining problem to insure the correct TECO tools or blanks for your needs. Catalog and price list on request.

TUNGSTEN ELECTRIC CORPORATION 568 39th Street, UNION CITY, N. J.
Branch Office: 403 Western Reserve Bldg., Cleveland 13, Ohio Representatives: Indianapolis, Ind., Chicago, Ill., Detroit, Mich.



Manufacturers of
TECO CARBIDE BLANKS and TOOLS

All standard sizes and styles. When ordering any carbide tools specify "Teco —no substitute."

Improved
TECO
CEMENTED CARBIDE

Manufacturers of Tungsten Carbide—from ore to finished material—for over a quarter century.

ENTRÉE TO THE
BEST IN INDUSTRY
PAST..PRESENT
...AND *FUTURE*

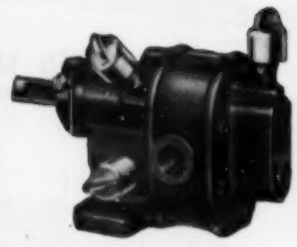
THE ABBOTT BALL COMPANY
HARTFORD 10, CONN.

PUMPS
You can install ...and then rely on!

Because of their sturdy, simple construction and precise manufacture, Brown & Sharpe Pumps deliver smooth, economical performance year after year—with minimum attention. Their long periods of trouble-free service have led many of the country's leading manufacturers to standardize on Brown & Sharpe Pumps.

Nos. 1 S, 2 S and 3 S ROTARY GEARED PUMPS WITH HELICAL GEARS . . . Quiet, smooth performance at high speeds for supplying coolant and lubricant . . . for general circulating purposes . . . and for low pressure hydraulic service. Renewable iron bearings. Mechanical seal prevents leakage and eliminates gland adjustments. Furnished with or without integral relief valves.

Nos. 53 and 55 ROTARY GEARED PUMPS WITH ROLLER BEARINGS AND HELICAL GEARS for supplying oil under pressure for hydraulic operation of machines. Extremely accurate helical gears run quietly at motor speeds, discharging large volumes of oil at high pressures. Although designed for direct drives, can be pulley or gear driven. Mechanical seal.



Nos. 21 and 23 BRONZE ROTARY GEARED PUMPS . . . Corrosion-resisting gears and shafts —suitable for providing circulation on water jacketed engines and for pumping saline solutions.

Write for catalog of complete pump line with detailed specifications. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

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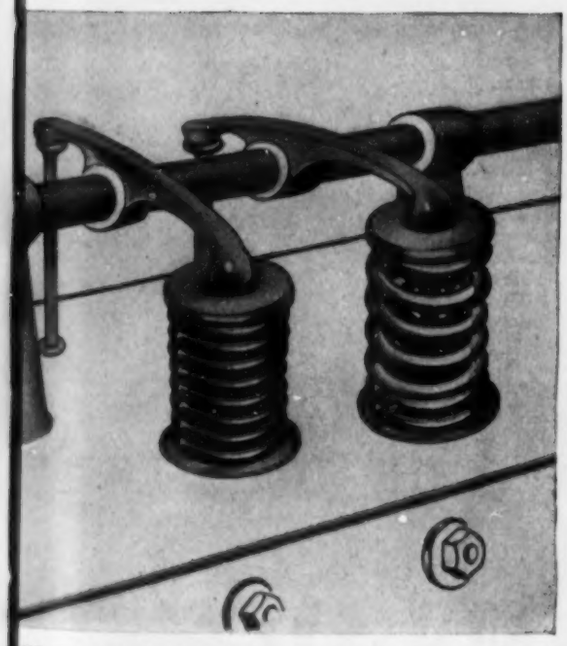
GEARED • VANE • CENTRIFUGAL • MOTOR DRIVEN

BROWN & SHARPE PUMPS

Confidence- WITH ITS SLEEVES ROLLED UP!



YEAR BY YEAR, planes grow bigger . . . faster and safer. Man has unbounded confidence in his ability to build better and better planes. Never satisfied, he experiments and tests tirelessly, and aviation progresses.

With similar vision and confidence, Roebling has been pacemaker in the development and manufacture of products essential to the transportation and other industries. The active, widespread confidence it has won among technical men and operators throughout industry is Roebling's proudest asset. Look to Roebling for continued leadership . . . continual improvement in its products and engineering . . . continual progress.

ROUND WIRE THAT'S "FOUR SQUARE" ON THE JOB

YOU GET WHAT YOU WANT with Roebling Round Wire . . . dimensional accuracy . . . the right tensile strength, ductility and finish . . . fewer rejects. The uniform quality of Roebling Round Wire enables you to maintain an exacting standard for your product.

Meeting stringent specifications is all in the day's work with Roebling. From steel mill to shipment, every manufacturing process is positively controlled. Roebling plants and equipment are up-to-the-minute and unsurpassed. Workmen are trained in special Roebling methods and techniques developed through experience in wire making that is without an equal.

Your Roebling Field Man may be able to show you new ways of stepping up production and cutting costs with Roebling Round Wire. Simply call your nearest Roebling branch office.

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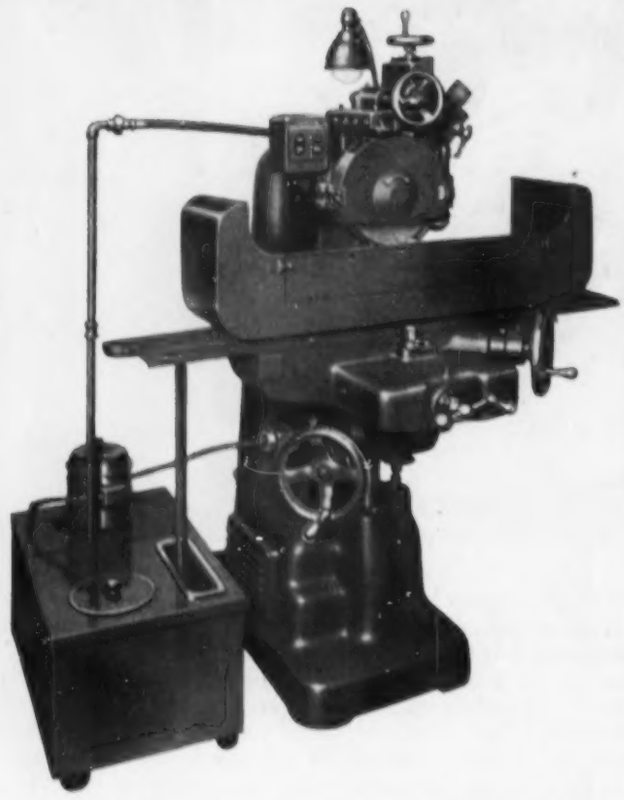
JR ROEBLING

★ *WIRE ROPE AND STRAND* ★ *FITTINGS* ★ *SLINGS* ★ *SUSPENSION BRIDGES AND CABLES* ★ *AIRCORD, AIRCORD TERMINALS AND AIR CONTROLS* ★ *AERIAL WIRE ROPE SYSTEMS* ★ *ELECTRICAL WIRE AND CABLE* ★ *SKI LIFTS* ★ *HARD, ANNEALED OR TEMPERED HIGH AND LOW CARBON FINE AND SPECIALTY WIRE, FLAT WIRE, COLD ROLLED STRIP AND COLD ROLLED SPRING STEEL* ★ *SCREEN, HARDWARE AND INDUSTRIAL WIRE CLOTH* ★ *LAWN MOWERS*

COVEL'S No. 15

Low-Cost Hand Feed SURFACE GRINDER

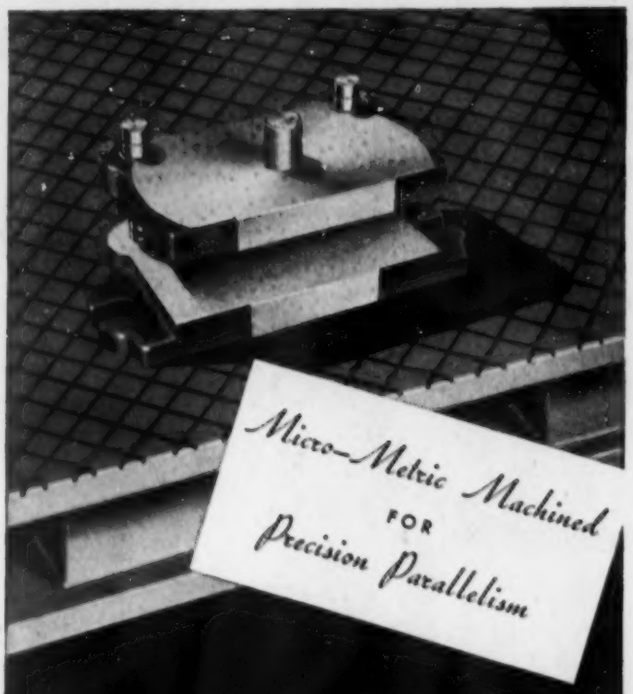


Proved in tool-room and on production line, this 6"x18", hand feed surface grinder combines up-to-the-minute improvements in grinding machinery with high standards of craftsmanship. Provides you with a tool that will materially help increase production and lower costs.

A built-in wheel truing device that keeps the wheel in tip-top shape without disturbing the work set-up—a ten inch grinding wheel mounted on a heavy, three-speed spindle that is driven by a husky 1½ H.P. motor—make the No. 15 stand head and shoulders above many grinders of its size and price class. For extra long life specify hard chrome plated table-ways they're available at extra cost. *Write us for the name of our dealer nearest you and ask for your free copy of Bulletin A-98.*

COVEL MANUFACTURING COMPANY

BENTON HARBOR MICHIGAN U.S.A.



"DETROIT" standard die sets are Micro-metric jig-bored and machined to exceptionally close limits of parallelism, flatness and squareness with the guide-pin axis. This precision reduces strain warping, and results in longer die life and long, uninterrupted production runs. Order from your "DETROIT" representative.

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DAYTON	HE 3042
INDIANAPOLIS	HU 5604
LOS ANGELES	AD 7251
MILWAUKEE	ED 2359
MINNEAPOLIS	AT 5264
PHILADELPHIA	VI 4-4084
PITTSBURGH	GR 1362
PORTLAND, ORE.	AT 3697
ROCK ISLAND, ILL.	RI 743
ST. LOUIS	FR 6811
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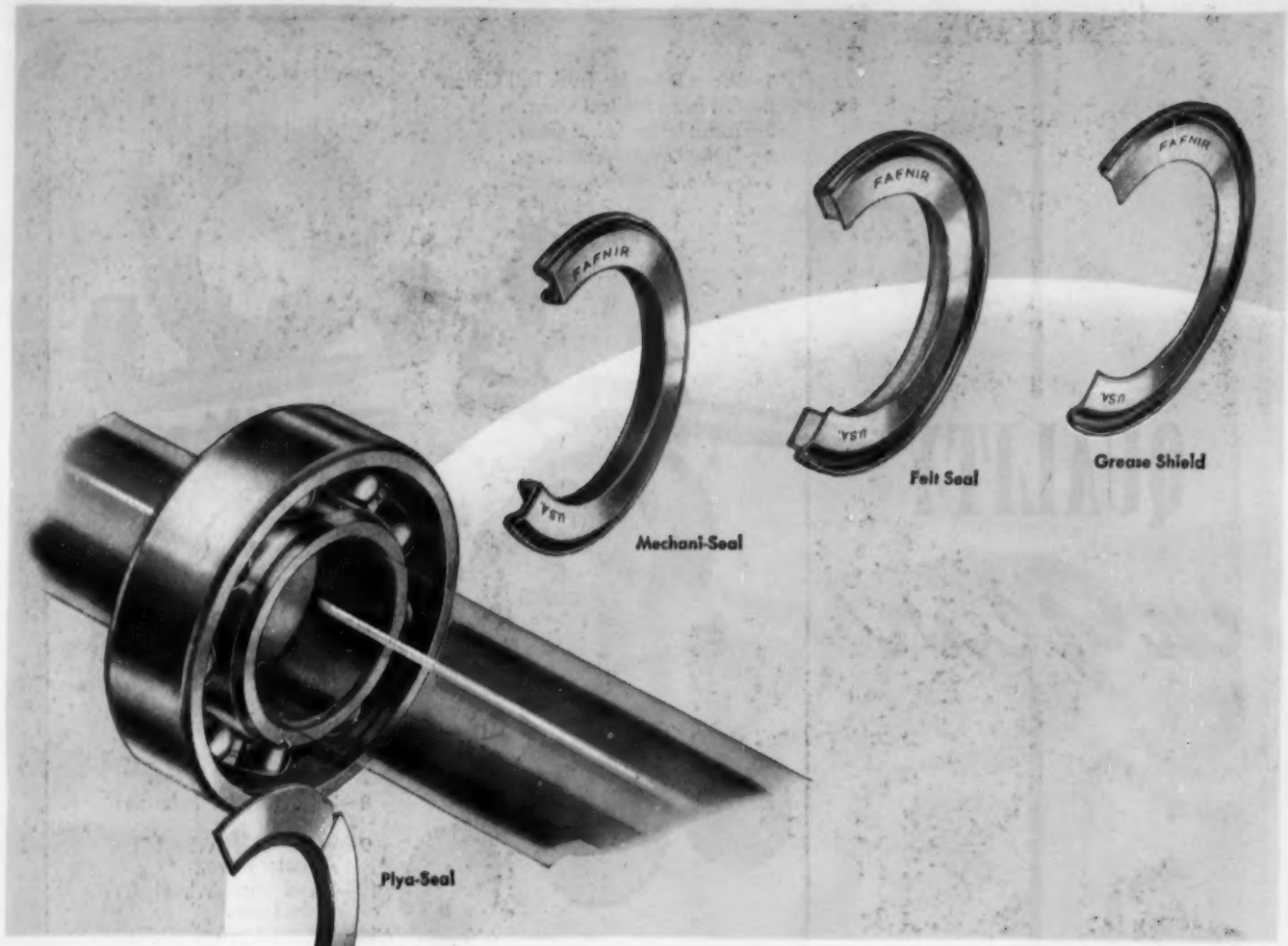
DETROIT DIE SET CORPORATION

2895 W. GRAND BLVD. • DETROIT 2, MICHIGAN

DETROIT DIE SETS ★



WORK CLOTHES
for ball bearings . . .

HOW TO LEAVE a ball bearing unencumbered as a bathing beauty and yet protect it with work clothes snug-fitted to thousandths of an inch? This job of sealing or shielding a ball bearing is a double job of keeping lubricant in and contaminants out. More than a quarter century of Fafnir research and development have been devoted to this single factor of ball bearing design. The result . . . a whole wardrobe of tailor-made work clothes that wrap up a ball bearing like a cocoon yet allow it perfect freedom of action . . . for work in cement mills, face to face with corrosive fumes and live steam, buried in abrasive sand or up to its shoulders in muck and water.

Some of these "wrap-ups" are simple as a work apron . . . just a precision-fitted single shield. Others are assemblies of felt rings and steel baffles. Another is an ingenious labyrinth of steel plates to foil either stray lubricant or contaminants. And the newest is a regular diving suit for complete sealing; yet it can be removed and replaced with a penknife.

None of which is half as interesting as the fact that the very first protective device for ball bearings was developed by Fafnir at the request of a manufacturer. It's Fafnir's readiness to work mind-to-mind with manufacturers that prompts so many developers of new products to think of Fafnir first. The Fafnir Bearing Company, New Britain, Connecticut.

FAFNIR BALL BEARINGS

MOST COMPLETE LINE IN AMERICA

QUALITY *in Gears*

1—Worm Drive for Truck Tail Gates.
2—Oil Pump Helical Gear.
3—Turret Lathe Spiral Gear.
4—Turret Lathe Worm Gear.
5-6—Worms for Auto-
7—Machine Tool Worm.
8—Lift Screw for Industrial Trucks.
9—Worm and Wheel for Agitator Drive.
10—Worm and Wheel for Lathe Drive.
11—Industrial Truck Drive Worm and Wheel.
12—Drive Worm for Truck.
13—Screw Machine Worm Wheel.
14—Hourglass Worm and Wheel for Tank Turret Drive.
15—Worm Wheel for Lifting Jack.

PRODUCT OF BAUSH MACHINE TOOL CO. SINCE 1896

Worms and worm gears of all types made to your specifications for superior performance in drives for machine tools—industrial trucks — conveyors — agitators — speed reducers prompt quotations on quantities large or small.

SEND US YOUR BLUEPRINTS FOR QUOTATION

BAUSH
MACHINE TOOL CO.
SPRINGFIELD 7, MASSACHUSETTS

✻ **Ready for immediate mailing—your personal copy of**

"Nation on the Move"

"Not an advertisement" is a quick way to describe "Nation on the Move"—a copy of which we will be proud to send you.

As the foreword indicates, this book is designed as a salute to the industry in which we take such pride – and as a tribute to our employees and to all good craftsmen everywhere whose services help keep our "Nation on the Move."

We believe you will enjoy the way this book has been written—and the things it has to say about your business and every business that contributes to the American tradition of progress.

If you would like a personal copy why not write for it now on your business or official stationery? There is no obligation of any kind.

DOUBLE DIAMOND
TRADE MARK
GEARS

Automotive Gear Works, Inc.
RICHMOND, INDIANA

☆Reg. U.S. Pat. Off.

FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS

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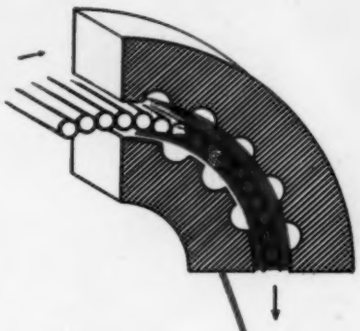
SELAS CORPORATION'S

Gradiation

SPEEDS FORGING . . . SAVES METAL



The unit heats bars to a distance of 2¼ inches at one end to 2250°F prior to forging. Bar stock varies from ½″ to 1½″ in diameter, and may vary in over-all length from 11″ and 30″. Production rate can be paced from 400 to 1000 pieces per hour.

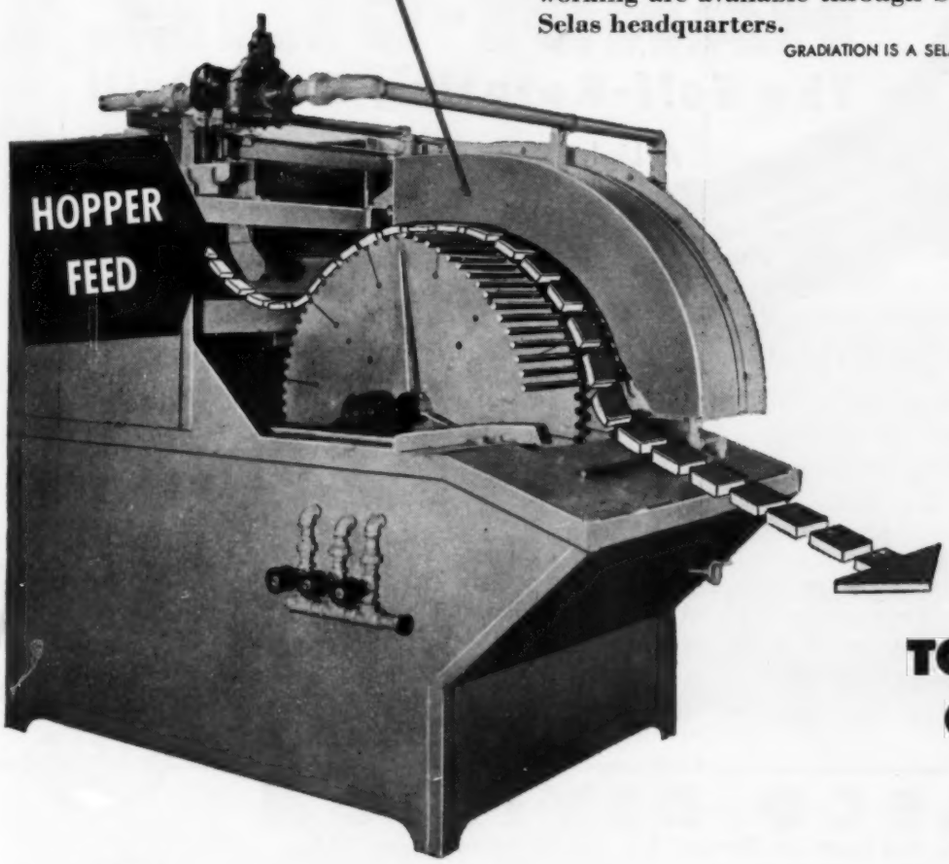
Here is another example of GRADIATION applied in forging operations to give exact pace in delivering heated blanks, to save metal and prolong die life.

Bar stock is placed in an automatic feeding hopper, whence it is fed onto two vertical, circular dials. The dials carry the bar ends into the heating tunnel in which a group of high temperature radiant burners are arranged to provide a precise heat pattern. Radiant energy transfers rapidly to and through the metal.

The result is precision controlled, uniform heating for forging. The method consumes less fuel, speeds up production, and controls scale with a consequent metal saving.

Heating for forging is but one heat-process for which Selas engineering develops precision tools utilizing new gas combustion techniques and engineers them to heating requirements. Data on other applications of GRADIATION to metalworking are available through Selas Representatives or from Selas headquarters.

GRADIATION IS A SELAS TRADE NAME



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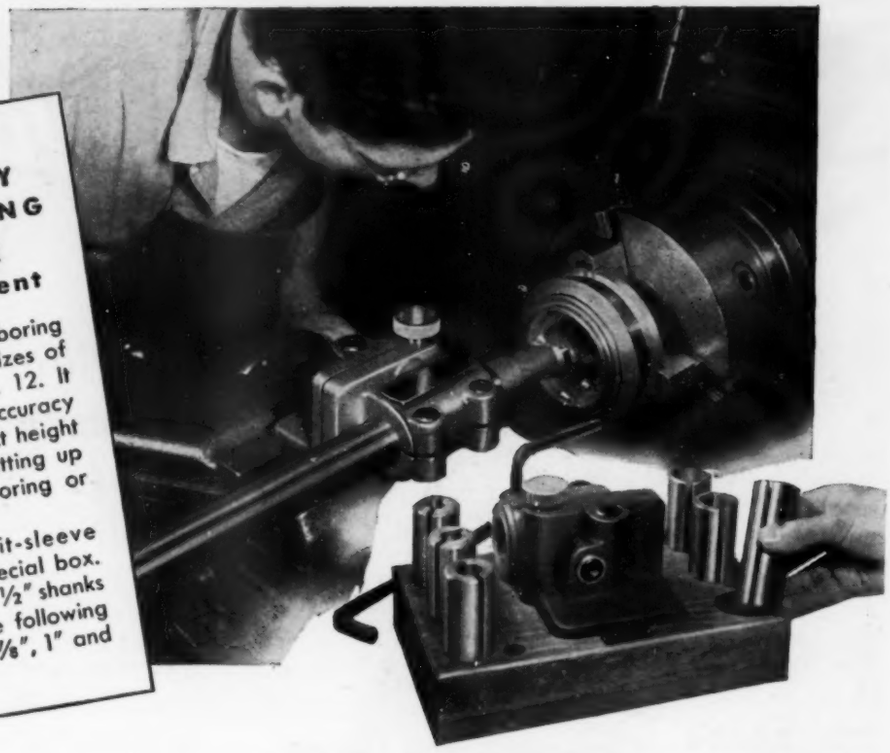

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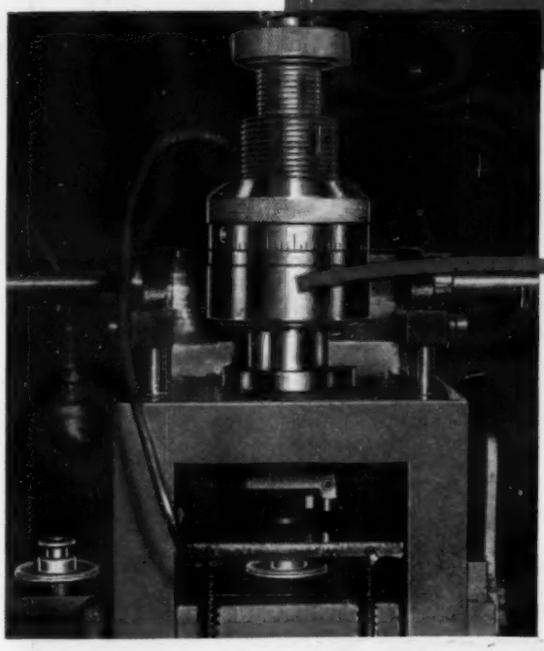

Scully-Jones Standard Type "J" Automatic Recessing Tool with special circular form cutter; being used at Grigsby-Allison Co., Inc., Arlington Heights, Ill. on a small Delta Drill press, to cut external groove on a zinc die cast clutch gear, at a rate of 300 per hour.

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4 Get long life—low maintenance cost—as all parts are hardened and ground, and built to take severe punishment.

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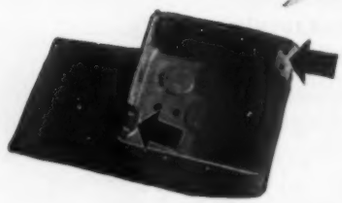

Four 8-32 holes are tapped in this electrical outlet box. Formerly, it was done by the single spindle method. Now, as above, it's done with an Ettco-Emrick Multiple Tapping Head and Fixture on a standard foot-operated tapping machine. The girl easily turns out 6,000 accurately tapped holes per hour—an increase of 200% over the old method.

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FIND OUT WHAT ETTCO-EMRICK MULTIPLE HEADS WILL DO FOR YOU

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BULLETIN NO. 31 gives full details and many examples. Write for a free copy today.

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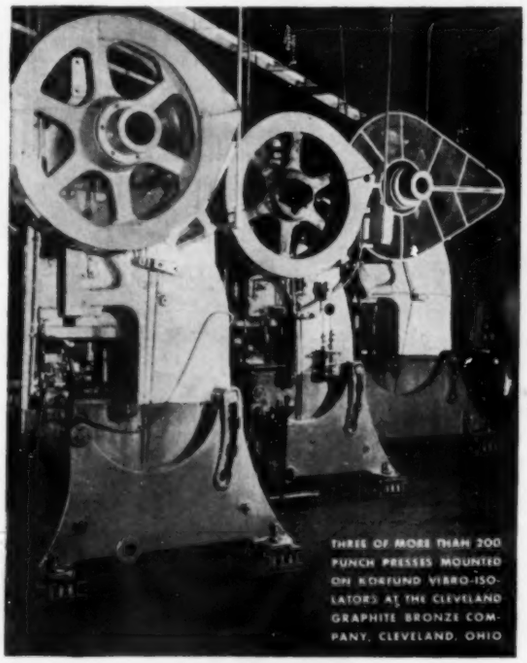

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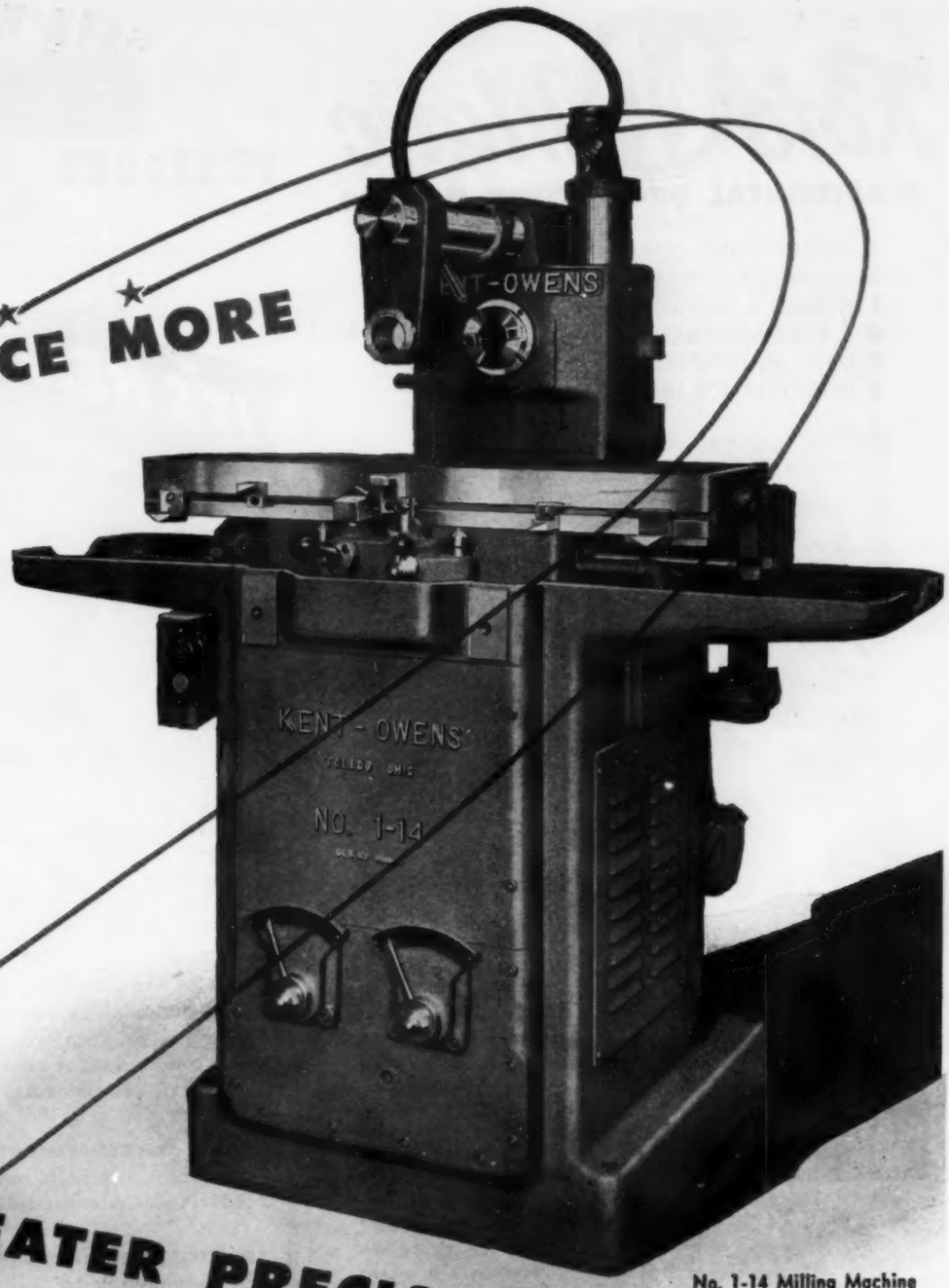

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Table travel, 14"

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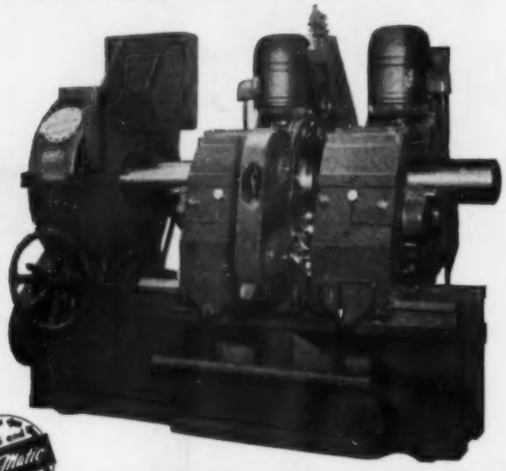
2 AUTOMATIC CHAIN CLAMPING
3 ROUGH & FINISH CUTTERS — EACH HEAD
4 3 TYPES — VARYING BED LENGTHS
5 LOW MAINTENANCE COST
6 INTERCHANGEABLE FIXTURES



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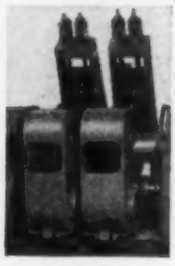
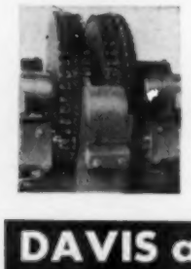
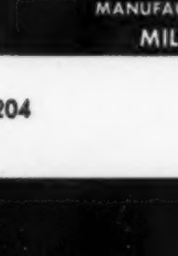


Chain Clamping Fixture for rough and finish milling both ends of Control Arm Trunions to length. Interchangeable buttons make possible the milling of several sizes — Production 296 gross per hour.



Double Chain Clamping Fixture with a total of 28 stations for milling ends of Clutch Gears — Production 200 gross per hour — With this arrangement two different parts can be milled simultaneously.



Double Drum — 50 automatic holding fixtures on each drum for rough and finish milling radius on Rocker Arms — Production 1400 gross per hour.

ASK FOR BULLETIN 121

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MANUFACTURERS OF *Machine Tools*
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Patent Pending

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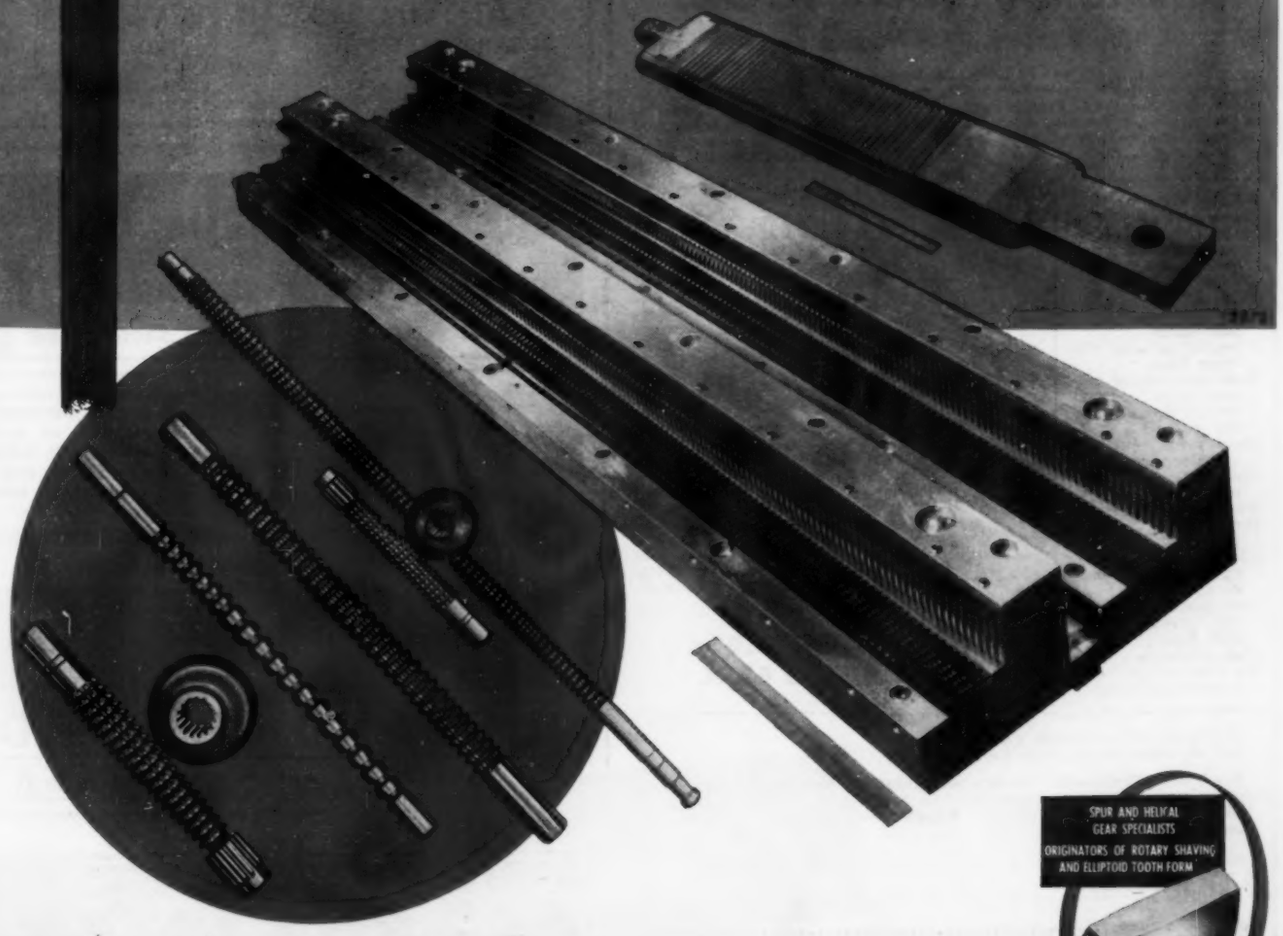

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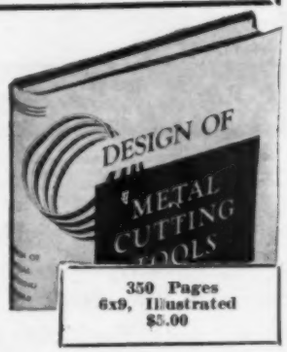
How to design
efficient money-saving
METAL CUTTING TOOLS



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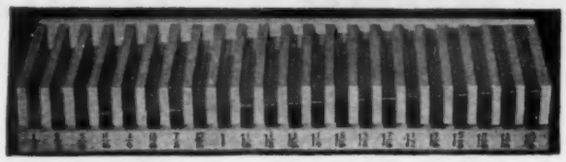

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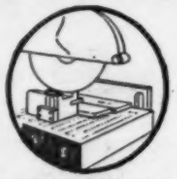
Improve Quality . . .
Use ANTON PARALLELS
they fill a long-felt need



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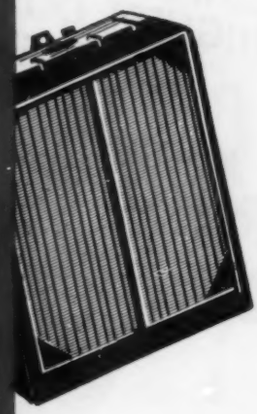
7 out of 11*

leading makers of radiators use OAKITE CLEANING MATERIALS



Why? Because Oakite materials provide effective, trouble-free cleaning at low cost! Leading makers of radiators prove that by using Oakite materials day-in and day-out to remove stamping and cutting paste; to clean cores before soldering; to clean parts before painting.

WHAT THAT MEANS TO YOU: Whatever your cleaning jobs—preparing aluminum for painting; preventing paint build-up in spray booths; removing rust from ferrous parts—Oakite materials put them on a low-cost, efficient basis. In the long list of over 80 Oakite materials there are alkaline, acidic and solvent type compounds; coolants and lubricants for machining; materials to rust-proof raw stock and parts in process.

HOW YOU CAN PROFIT: Merely contact the Oakite Technical Service Representative near you for answers to your cleaning problems. He'll be glad to help you work out trouble-free cleaning procedures. Free data sheets on cleaning processes also available. Both services free. Write.

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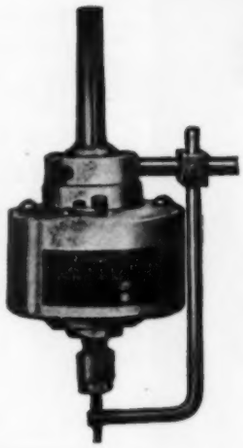

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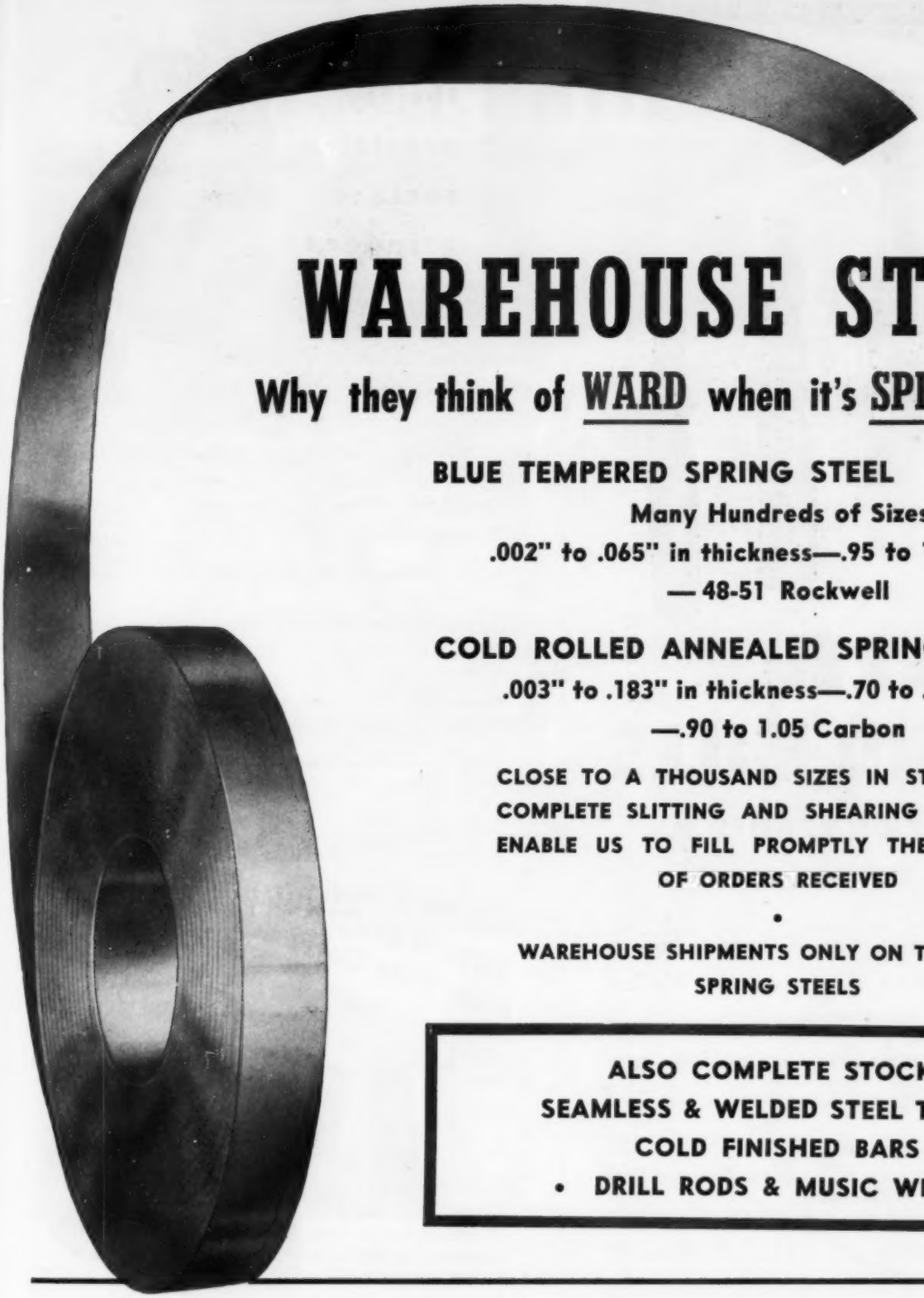

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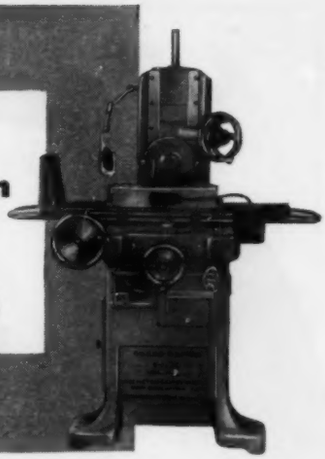

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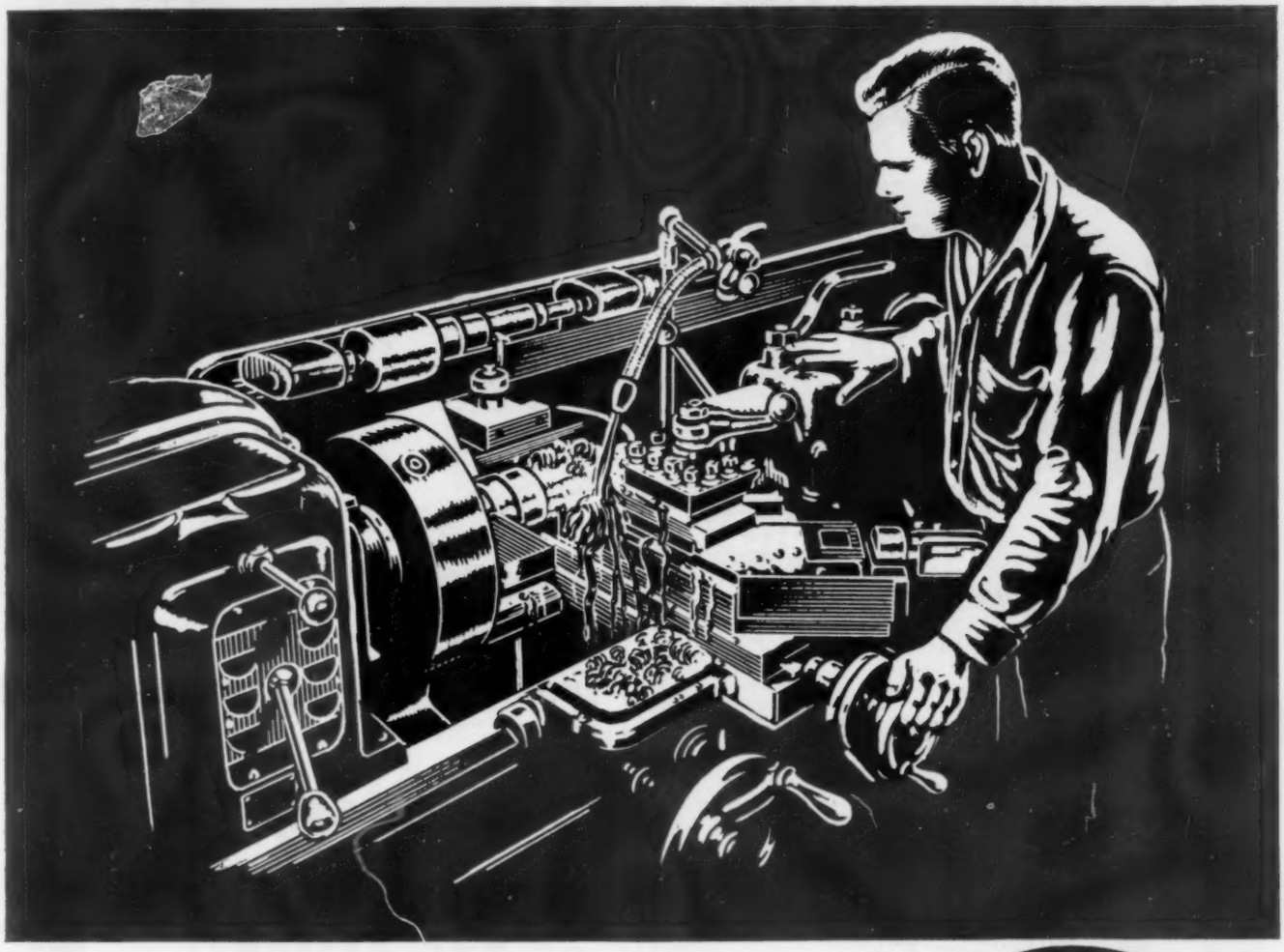

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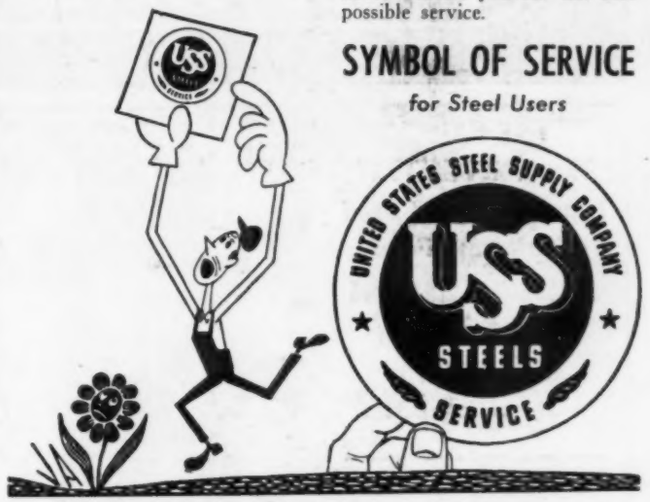

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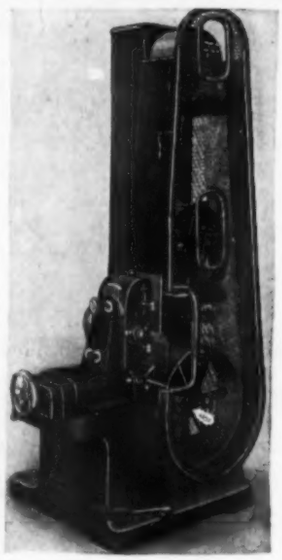

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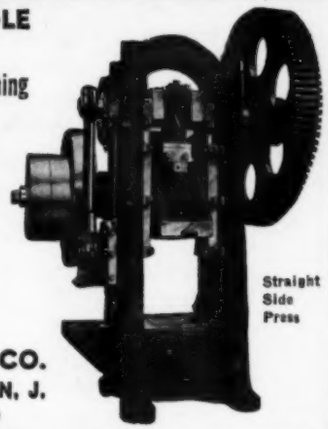

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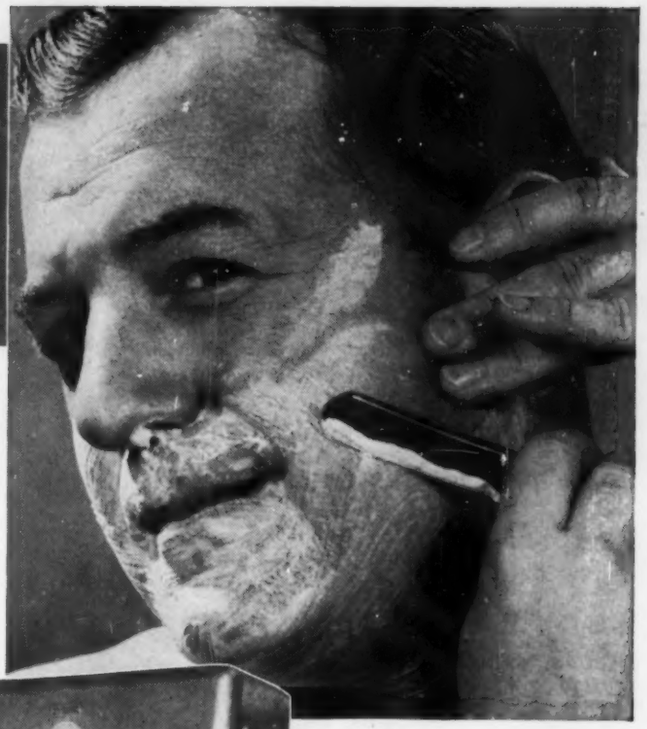

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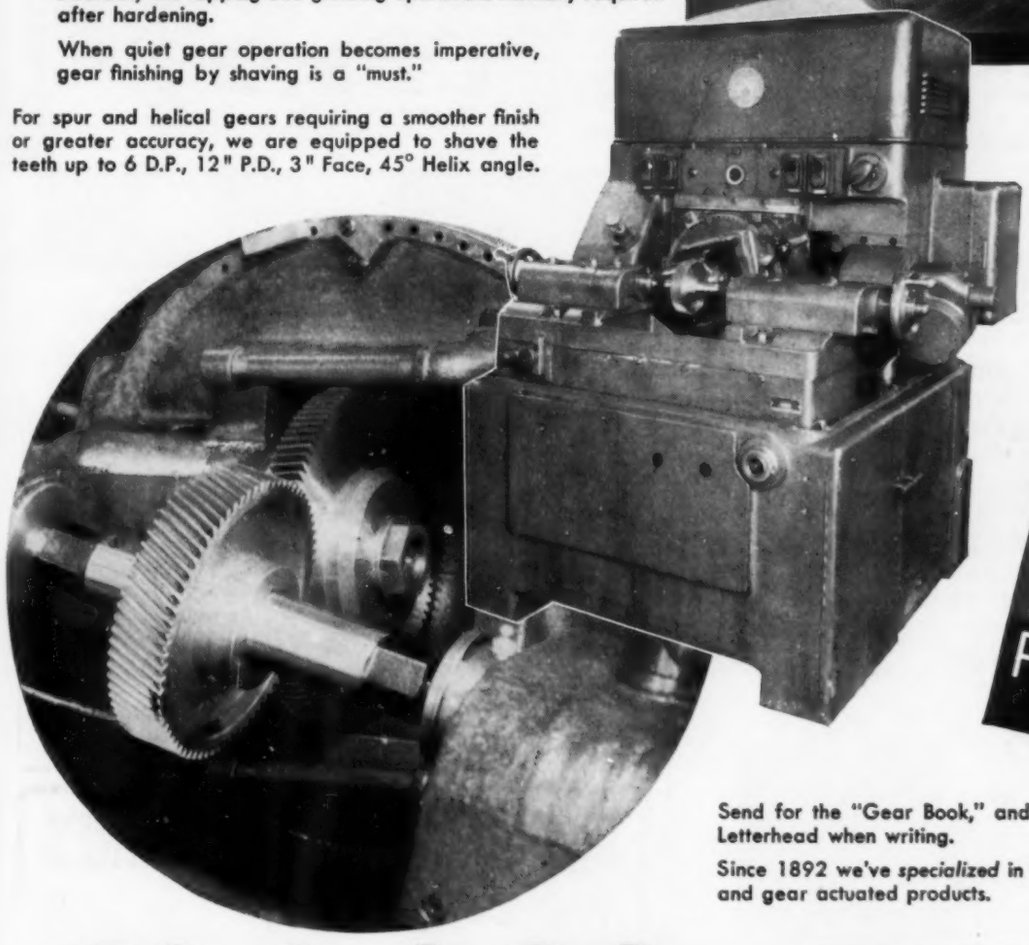

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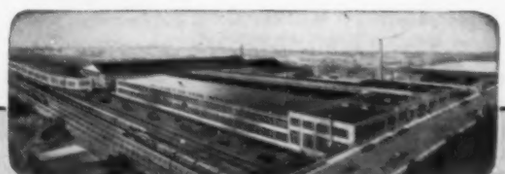

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

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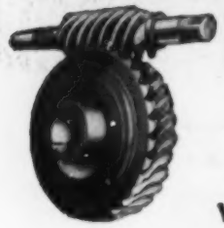
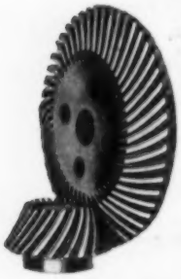
Brad Foote Gears





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SPUR OR HELICAL GEARS — Shaved tooth up to 20" dia., 8" face, 2 D.P.

SPUR GEARS — Form Cut—to 96" dia., 24" face — up to 4" C.P.

SPUR GEARS — Hobbed Generated — to 108" dia., 18" face — up to 1 D.P.

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SPUR GEARS — Ground tooth up to 18" dia., 12" face — 2 D.P.

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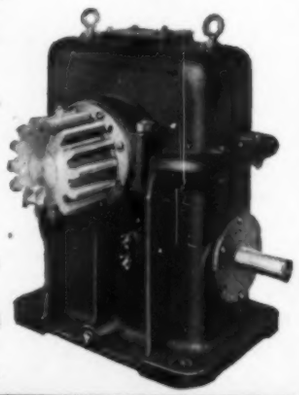
ACME SCREWS — Milled up to 6" dia. 30 ft. length

SPEED REDUCERS



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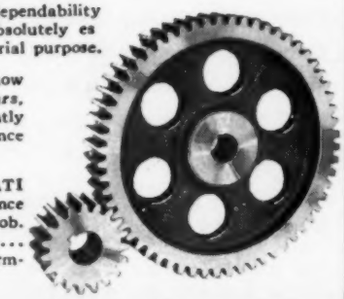

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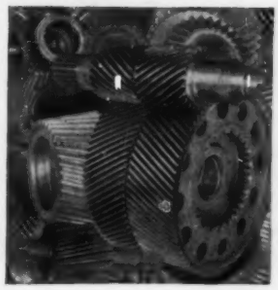

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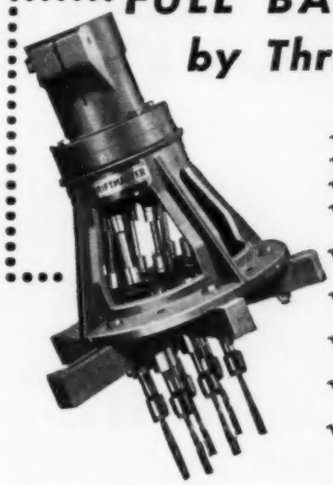

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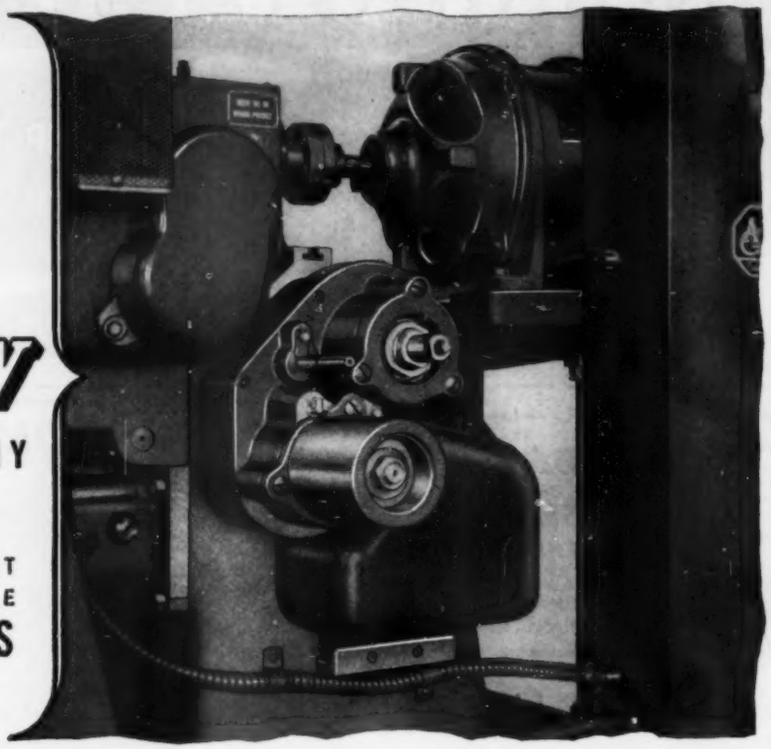

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These 3 precision machine tools are a necessary part of every completely tooled shop . . . a modern precision lathe with "Zero Precision" tapered roller bearings that will retain its extreme accuracy at new high operating speeds . . . a convenient back-geared shaper that embodies all major improvements . . . a capable small milling machine that will do accurate work . . . all three are extremely moderate in price.

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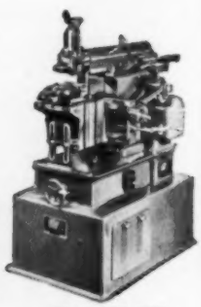

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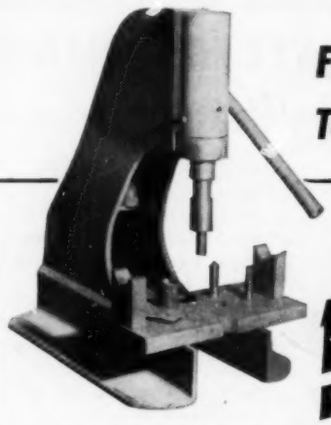

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HYDRAULIC ARBOR PRESS

A ten-ton press you can carry right to the job . . . it weighs only 101 lbs.

Has 8¼" throat depth, plus 12⅜" ram travel (6⅜" hydraulic stroke plus 6" mechanical adjustment).

Easy to Operate . . . short strokes of pump lever quickly build up working pressure to full 20,000 lb. capacity. Only two controls, pump lever and release valve. Low price includes all attachments illustrated. (Ruger 20,000 lb. pressure gauge furnished as optional, extra equipment.)

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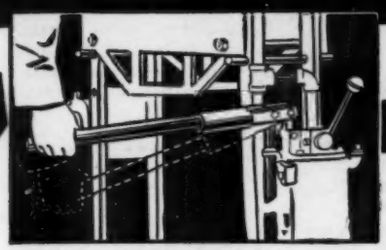
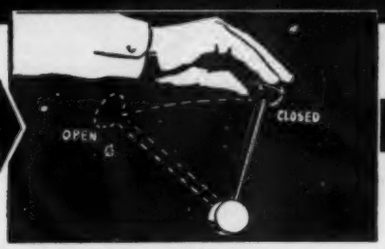
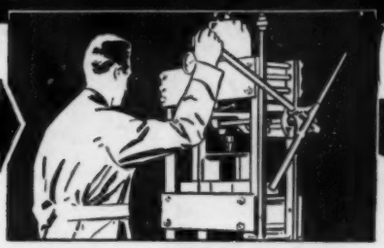
These **KRW** *Hydraulic Arbor Press Features ...*



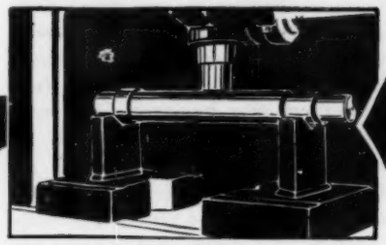
Fast Action, cylinder is filled as ram travels to work. You get tons of pressure with first pump stroke.



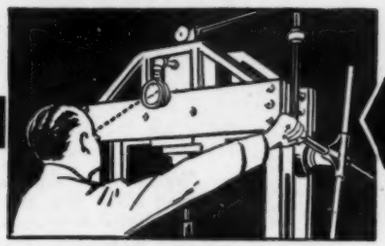
Finger Tip Control opens and closes valve in a jiffy. No gripping effort assures easier, faster operation.



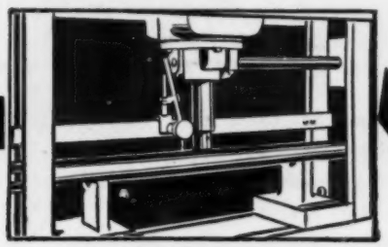
KRW Built-in Mechanical Press permits up to 3 tons pressure for straightening small diameter work.



One Piece, All Steel V-Blocks have machined surfaces for greater accuracy; usable upright or inverted.

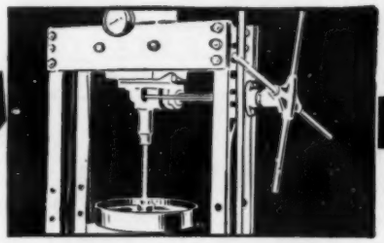


Highly Visible Pressure Gauges are mounted where they can be quickly checked. Read in tons and pounds.

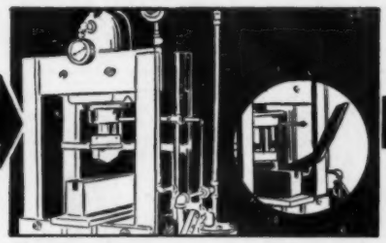


Micrometer Dial Attachment permits great accuracy in checking work without removing from V-block.

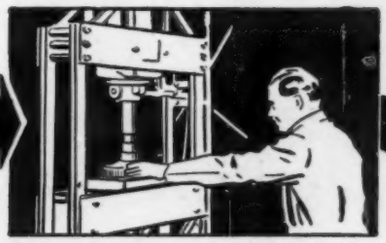
Reduce Costs ON THESE AND OTHER DAILY *Production Jobs ...*



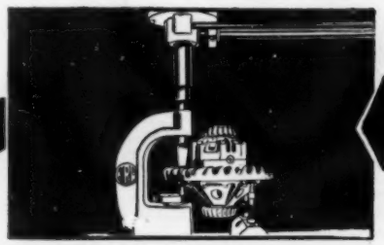
Broaching a key way in a flywheel. 7½ inch ram travel makes many broaching jobs practical on KRW Presses.



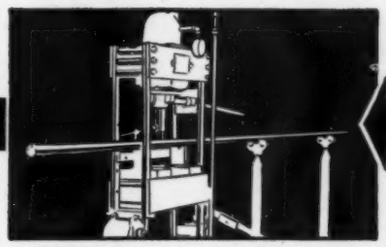
Bending in production lots with simple, inexpensive dies is easily done on low-cost KRW Hand-operated Presses.



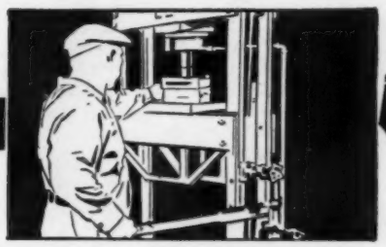
Pressing of all types is efficiently handled. Adjustable bed makes pressing on long shafts a very simple operation.



Riveting with KRW Riveting Attachment is simplicity itself. Many KRW Presses are used for this type work.



Straightening, especially on long work, is easy on a KRW Press because of its special open-end construction.



Blanking is easy with simple die set for short-run operations. Releases regular equipment for quantity production.

Write for the **NEW KRW** *Catalog.....*

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Please mail me a copy of your Hydraulic Arbor Press Catalog

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Sub-Zero Temperatures

AS LOW AS 150° BELOW ZERO!

Processing costs at sub-zero temperatures to —150° F. are lower with Bowser Chilling Machines. With Bowser mechanical direct expansion refrigeration there is no dependence on outside sources of expendable material such as "dry ice" or "liquid gases."

Bowser engineers will promptly reply to any questions concerning your production problems. Test facilities are available for proving recommendations.

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FOR EXPANSION FITTING OF CRITICAL ASSEMBLIES

. . . cuts inspection rejects in bushing, sleeve, valve inserts, liners, seals, bearings, races, gears, pins, collars, shafts, etc. Bowser processing eliminates much reaming because super finishes are retained when Bowser expansion fitting attains perfect mating without distortion.

. . . compared with shrink fitting employing heat, and arbor press fits, Bowser expansion fitting saves time and produces uniform, quality work.

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The same Bowser Industrial Sub-Zero Unit hardens cutting tools after heat treat and draw operations to increase life between grinds. Hardness of ferrous alloys may be increased several Rockwell "C" units when desired.

Metal stabilizing is accomplished by fast, complete "aging" of ferrous castings, parts or finished pieces, to prevent "growth" or dimensional changes or warping.

MODELS FOR LABORATORY AND INDUSTRIAL USE

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"Standard" ROLLING MILLS

FOR HOT OR COLD ROLLING OF STRIP, ROD AND INGOT

Speeds are provided for rolling metals in any range to 1000 feet per minute and tandem mill stands are designed with constant torque to synchronize stock between stations. Two, three, or four high Mills have roll sizes from 1½" diameter and 1" face to 16½" diameter and 18" face. Special units are also available for grading, cross and pinch rolling, forming wire to exact dimensions and for various shaping operations. Write for Catalog RM.

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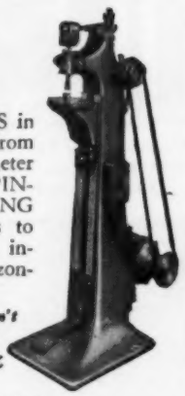
RIVETERS — PIONEERS in their line—head rivets from smallest to ⅝" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.



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Multiple Spindle Drilling and Tapping Machines — Automatic Drilling and Tapping Units — Multiple Spindle Attachable Drill Heads—Hot and Cold Swaging Machines—Hammering Machines — Tools, Jigs & Fixtures — Contract Work — Special Machinery

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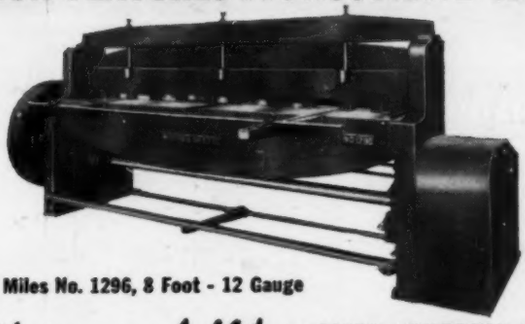

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Cut shearing overhead on metals up to 10 gauge with *Wysong and Miles* Power Squaring Shears. Balanced semi-steel construction insures accurate alignment. Precision features cut down shearing time and give accurate work.

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Individual spring activated plunger in each foot firmly clamps full sheets or small strips that come only under one plunger.

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Ball-bearing, parallel back gauge is quickly adjusted to .0078 (1/128th) of an inch by a handwheel dial reading.

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Treadle activated friction clutch gives quick pick-up with a minimum jar. Clutch has a non-repeat safety feature.

Other fine Wysong and Miles Squaring Shears in 10, 12 and 14 gauge. Write for complete information.

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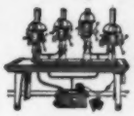
Use these compact self-contained units as



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Volume to 43 GPM—Pressures to 50 PSI

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In these efficient centrifugal machines the washing solution enters the top of the whirling load under valve control. The operating principle—being that of a typhoon—gives the washing solution a spraying, swirling, and surging action which thoroughly permeates the contents. During this action, centrifugal force creates hydrostatic pressure within the basket. That proportion of the deluge going to the bottom is forced up the side and out carrying off the contaminated fluid.

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As in all Barrett Centrifugal machines, provision is made for convenience and safety of operation.

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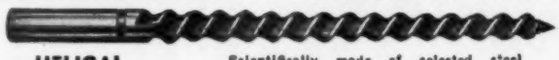

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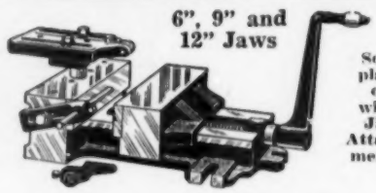

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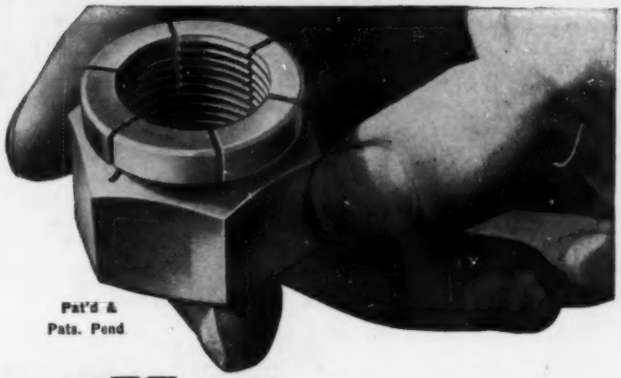

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FLEXLOC ONE-PIECE SELF-LOCKING NUTS

The one-piece, all-metal "Flexloc" packs maximum usefulness in minimum space by combining, as it does, a stop, a lock and a plain nut all in one.

Every thread—including the locking threads—takes its share of the load. "Flexloc" accommodates itself to a wide range of thread tolerances . . . can be used over and over again without losing much of its locking torque . . . is not affected by temperatures likely to be met within the field of Mechanical Engineering . . . and being a "stop" nut, it stays locked in any position on the threaded member. The "Flexloc" is processed to have an exceptionally uniform torque.

The *Thin* "Flexloc" has become very popular because its *tensile* is so high and the space it occupies so small.

Sizes from #6 to 2" in diameter—in "regular" and "thin" types—in NC and NF thread series. *Write for "Flexloc" Catalog.*

OVER 45 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

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ECONOMY

THE W&B CO

ECONOMY Lubricant 1888
fluid type - water soluble
For Grinding and Cutting

Highly detergent—
assures open and free cutting wheels,
clean machines and parts

THE WHITE & BAGLEY COMPANY

WORCESTER, MASS. • DETROIT, MICH.

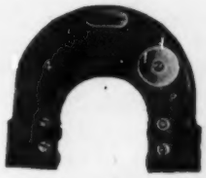
Originators of Grinding Lubricants

SCHERR *aids to precision – production*

THE COMPARITOL

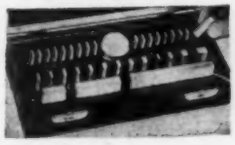
Where inspection accuracy to "Tenths" and better is absolutely essential in such parts as gages, thread, fine wires, cylindrical ground work, etc., *etc.*, the Scherr Comparitol will give indisputable results. It can be used by anyone with a few minutes' instruction, can be placed near machines for constant spot inspection, as well as used for final inspection. Long-lived patented knife-edge mechanism needs no oiling, has no gears, racks, multiple levers, pivots or bearings, no electrical connections, bulbs or transformers. Thousands in profitable use everywhere. Price—complete with serrated table 6", $165.00—8", $185.00.

ATLANTIC Adjustable Limit SNAP GAGES



Made in strict accordance with American Gage Design Committee specifications. Frames of Meehanite. Wide range of sizes, from .195 to 11 5-8". With round or square gaging pins, solid anvil, extended anvil, etc. The last word in snap gages, and at most interesting prices. Write us for details—and also about the Scherr special service for trueing and setting worn gages.

ULTRA-CHEX GAGE BLOCKS

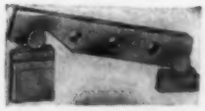


The last word in modern basic accuracy brought within the grasp of all shops large and small. Sets in size for all budgets. All blocks accurate to 5 millionths. Illustrated is the 34-block set, giving 80,000 combinations in steps of 1/10,000", with optical flat for checking wear. Low prices allow for constant practical shop use in setting tools, checking gages, locating holes in jigs, and fixtures, etc. Many shops use a number of sets, with one master set for reference. Price—9 block set for Tool makers and micrometer checking, $27.50. 34 block set, $125.00.

OPTICAL FLATS

Essential for checking wear and flatness of lapped surfaces. Reveal deviation in millionths from absolute flatness or parallelism of micrometer anvil, gage blocks, refrigerator, airplane parts, etc. Sizes up to 4" or over in optical glass or quartz. Price 1¼", $10.00.

SINE BAR



Thoroughly normalized for undeviating accuracy. Two sizes —1"x5-8"x5", Price $26.00 lapped, and 1"x1¼"x5", Price — $26.50 ground — $36.50 lapped. Type G has ground edges. Type L lapped edges. Extremely low price makes this valuable tool available for the individual owner as well as in quantity for the toolroom. Write for full details on these tools, and for the Scherr Small Tool Catalog.

GEO. SCHERR CO., Inc.

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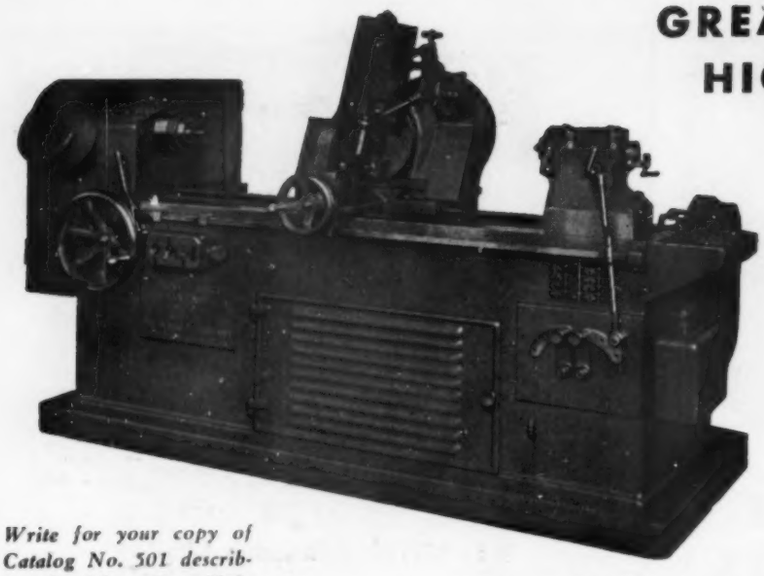

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HIGHER ACCURACY
EASIER CONTROL
MORE OUTPUT

with ADAMS Gear Hubber and Thread Miller

Write for your copy of Catalog No. 501 describing the Adams Gear Hobber and Thread Miller and the Adams Manufacturing Hobber.

The Adams Gear Hobber and Thread Miller combines the precision and productivity of mass production machines with the flexibility and range of general purpose tools. The many features that insure smooth and rapid operation, great durability and enduring accuracy and alignment include: Multiple disc clutch and silent chain drive . . . sliding gear transmission . . . six-splined transmission and drive shafts . . . heat treated alloy steel gears . . . automatic lubrication . . . powerful balanced head drive . . . anti-friction bearings.

Write for complete details.
THE ADAMS COMPANY, 1905 Bridge St., Dubuque, Iowa.

The ADAMS Company, Dubuque, Iowa, U.S.A.

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EFFECTIVE APRIL 1ST

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List Price of set 84B advertised elsewhere in this magazine remains same

WEBBER GAGE COMPANY
12901 Triskett Road, Cleveland 11, Ohio

80 Pages of . . .
BASIC INFORMATION
To Help Speed Employee Training

HERE'S PRACTICAL HELP FOR THOSE WHO MUST BE TRAINED FOR SHOP JOBS

A word-and-picture book of machine shop tools, their operation, and their uses. Just what the novice needs to know to get started fast. Management is finding "The Tools of Our Trade" extremely helpful in training new employees. Contains five illustrated articles which first appeared in *American Machinist:*

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WHY USE ONE-HORSE SHAY METHODS IN THESE JET-PROPULSION DAYS

The modern shop requires speedy as well as accurate tap sharpening—the kind that anyone can do on the BLAKE: the Tap Grinder that makes everyone a fast expert tap sharpener.

Our surveys of hundreds of Blake Tap Grinder Users show these results:

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The BLAKE TAP GRINDER

Sharpens both right and left hand taps—with 2, 3, 4, 5, 6, 8 or 10 flutes. Also economically sharpens many other tools requiring relief on the cutting edges. Get the full details by sending the handy coupon today.

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EYE-APPEAL?

RUSTPROOFING?

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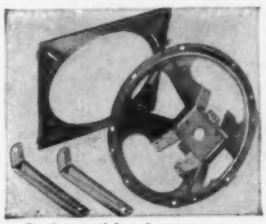
Whatever your problem in finishing zinc or cadmium, there's an Iridite* to do the job. Iridite, a quick-dip, chemical treatment, offers you these three advantages—



Radio and hardware parts, permanently brightened with Iridite.

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On plated parts Iridite forms a long lasting, sparkling *bright* finish that *stays bright*, even after handling, storage, exposure. On all surfaces, Iridite can be used to produce a variety of colored finishes.

Wire cloth and galvanized bucket, Iridited for extreme corrosion-resistance.

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Hardware products, Iridited and painted for peak finishing system efficiency.

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On any zinc or cadmium surface that must be painted, Iridite insures a better finishing system because the coating improves initial paint adherence, blocks corrosion *under* paint, blocks formation of metallic soaps *between* paint and metal.

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Rectangular Heat Baths

For liquid heat treating baths, soft metal melting, etc.

The High Speed Full Muffle Furnace attains a temperature of 2400° F., and is designed for High Carbon and Alloy Steels.

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Full Muffle Furnace (Bench Type)

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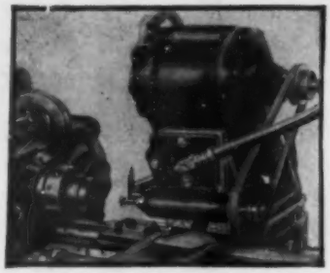
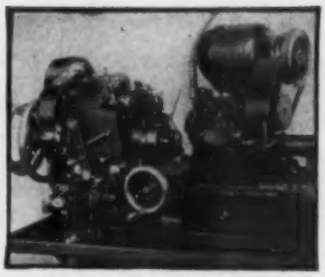


Machine with Internal Milling Attachment



Machine equipped with Relieving Mechanism

Flexibility for handling unusual work assured by availability of special attachments

In addition to producing all standard forms of threads, the Waltham Thread Miller, with special equipment, can be used for relieving, internal threading and plain taper work. Other equipment, also available extends its utility to multiple cutting automatic cam control, and metric thread cutting.

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This low cost machine will handle internal keyseating jobs up to 1¼ in.

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All Baumbach Die-Sets have demountable Leader Pins and Bushings. This exclusive feature permits removing Leader pins for machine work on the die shoe and assures reassembly without loss of alignment. A big time and trouble saver. Write for Catalog.

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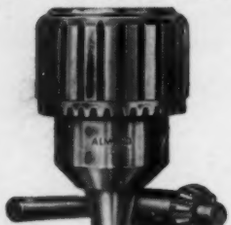

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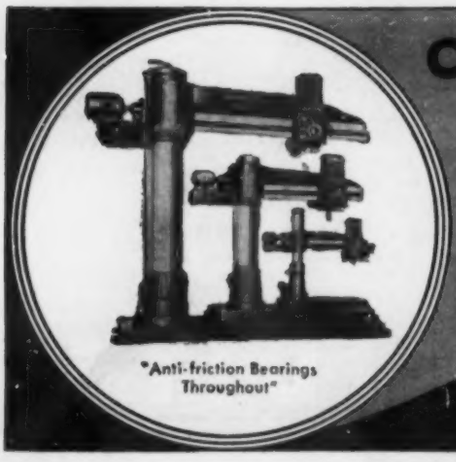

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FEATURES: 1. Low Hung Drive to Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all Speeds. 4. Concentrated and Convenient Push-button Controls. 5. Constructed on Unit Principle.

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CINCINNATI 25, OHIO, U. S. A.

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(Not good after June 1, 1948)

New Catalogues, Booklets, Bulletins

MACHINES and ATTACHMENTS

1 DIE-LESS DUPLICATING—O'Neil-Irwin Mfg. Co., Lake City, Minn. 40-page booklet contains illustrations and specifications of all Di-Arco precision machines which are now available in six different types and a total of eighteen different sizes.

2 HOW TO SELECT A PRESS—Verson Allsteel Press Co., Chicago 9, Ill. 20-page bulletin G-47 on hydraulic and mechanical press selection was prepared as a guide for selection of press most suitable for job requirements, and methods of power application most efficient. Many varied types of presses are covered.

3 BROACHING MACHINES — The Gilgear Co., Milwaukee 4, Wis. 12-page bulletin 22,001 covers company's Cyclematic fluid-power, variable-speed broaching machines. Illustrated are close-up views of tools, fixtures and machines.

4 DRILLS—Canedy-Otto Mfg. Co., Chicago Heights, Ill. Folder covers the Comco radial drill, Infi-Speed drill, 21-in. box-column sliding-head floor drill, and C-O-Draulic power-feed drill.

5 DIE MAKING—Connecticut Tool and Engineering Co., Bridgeport 4, Conn. 8-page bulletin illustrates and describes the Williams die-making machine, which files dies, gages, cams, templets and machine parts.

6 SURFACE GRINDER — Pratt & WHITNEY, Div., Niles-Bement-Pond Co., West Hartford 1, Conn. 8-page folder gives information on their heavy-duty hydraulic vertical surface grinder. Specifications and illustrations are included.

7 MILLING MACHINES—Van Norman Co., Springfield 7, Mass. 6-page folder contains information on the No 16 ram-type milling machine with adjustable cutterhead, for horizontal, angular, and vertical milling.

8 LATHE—Atlas Press Co., Kalamazoo, Mich. 12-page bulletin L47 illustrates and describes the Atlas quickchange 10-in. lathe. Information is given on available attachments.

TOOLS and ACCESSORIES

9 PUNCHES AND OTHER TOOLS—Geo. F. Marchand Co., Chicago 8, Ill. 48-page catalog 46 describes and illustrates with drawings, tools manufactured, showing detailed specifications for punches and dies.

10 CIRCULAR SAWS, DRILL-JIG BUSHINGS—W. P. Meyers Co., Inc., Bedford, Ind. One 4-page folder and one 6-page folder illustrate and describe, respectively, Meyco line of carbide-tipped plastic-cutting circular saws, and Meyco carbide-inserted drill-jig bushings. On the latter, a hardened-steel ring is inserted above the top carbide ring for protection.

11 CARBIDE-TIPPED TOOLS—Chicago-Latrobe Twist Drill Works, Chicago 10, Ill. 24-page booklet gives illustrations and specifications on tools, including taper-shank drills, straight-shank drills, varied-type reamers and other tools.

12 HOLE PUNCHING UNITS—Wales-Strippit Corp., North Tonawanda, N. Y., 16-page bulletin C illustrates and describes units for punching rivet holes in sheets, angles and extrusions. Wales C, E, and EJ units are self-contained with nothing attached to press ram.

13 STIFFNESS TESTERS — Thiaus Gloss Testing Machine Co., Philadelphia 23, Pa. 16-page pamphlet 35 covers complete line of stiffness testing machines available in 1, 6, and 50-in.-lb. moment capacities.

14 PUNCH POINTERS — Allied Products Corp., Richard Bros. Div., Detroit 8, Mich. 14-page booklet gives information in cartoon style, on proper punch-press operation and care of R-B interchangeable punches and dies.

15 FACE-MILLING CUTTERS—Continental Tool Works, Div., Ex-Cell-O Corp., Detroit 6, Mich. 8-page bulletin 60181 covers line of inserted-blade face-milling cutters, furnished with carbide-tipped or high-speed steel blades in positive or negative rake.

16 TOOL CATALOG — Butterfield Div., Union Twist Drill Co., Derby Line, Vt. 224-page catalog 23 covers completely with specifications, line of taps, dies, screw plates, and reamers. Illustrations are given.

17 MOLD BASES, PARTS, PRODUCTS—Detroit Mold Engineering Co., Detroit 12, Mich. 152-page catalog spirally bound, and indexed, gives with illustrations, information on complete line of standard mold bases for plastics and metal die castings.

HEAT-TREATING and WELDING

18 RESISTANCE-WELDING TIPS, HOLDERS, ALLOYS—P. R. Mallory & Co. Inc., Indianapolis 6, Ind. 42-page booklet illustrates and describes line of resistance-welding tips, holders and alloys. Section describes the physical and mechanical properties of 8 electrode alloys, and Elkonite line.

19 HEAT-TREATING FURNACES —Cooley Electric Mfg. Corp, Indianapolis, Ind. 18-page bulletin covers line of small electric heat-treating furnaces with controlling and accessory equipment.

20 WELDING PRODUCTS — American Manganese Steel Div., American Brake Shoe Co., Chicago Heights, Ill. 28-page bulletin 1047-W gives characteristics and specifications for Amsco welding rods and electrodes.

21 ALLOY, WELDABILITY DIRECTORY—Electric Welding Alloys Corp., New York 13, N. Y. 8-page pamphlet shows weldability of several thousand commercial alloys, as revealed by type of weld, equipment design, and practical application of special gas- and arc-welding rods.

22 HEAT-TREATING FURNACES —Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. 30-page bulletin B-3281, spirally bound, covers furnaces for hardening, annealing, drawing, brazing, nitriding, sintering, normalizing, solution treatment, and, gas-atmosphere generators.

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PLANT SERVICE EQUIPMENT

23 TRACTORS, TRAILERS, LIFT TRUCKS—The Mercury Mfg. Co., Chicago 9, Ill., 56-page booklet, 7-11 spirally bound; covers with illustrations and specifications line of tractors, trailers, and lift trucks. Drawings are included.

24 CONVEYOR-ELEVATORS—Stephens-Adamson Mfg. Co., Aurora, Ill. 60 page catalog 140, spirally bound, contains information on line of conveyor-elevators, including capacities and actual applications.

25 FORK TRUCKS, AXLES—Clark Equipment Co., Clark Tructractor Div., Battle Creek, Mich. 24-page pamphlet gives information on Clark electric fork trucks, axles, towing tractors, metal-spoke wheels, gas-powered fork trucks, and transmissions.

26 AIR-RECOVERY EQUIPMENT—W. S. Conner Engineering Corp., New York 16, N. Y., 16-page bulletin 105-A covers Type H Dorer Air-Recovery Equipment, used in the recovery or conversion of stale, vitiated, or contaminated air.

27 CONTINUOUS-POWER CONVEYOR—Richard-Wilcox Mfg. Co., Aurora, Ill. 36-page booklet A-83 illustrates and describes company's No. 2035 Zig-Zag continuous-power conveyor.

28 GRAVITY AND POWER UNITS—Standard Conveyor Co., North St. Paul 9, Minn., 15-page bulletin 31 covers gravity and power conveyors, including information on straight-section and curved-section type conveyors, both wheel and roller type.

29 LIGHTING—The Fostoria Pressed Steel Corp., Fostoria, Ohio. 6-page folder acts as a guide for footcandle levels and gives illustrations for various lighting applications.

30 HEAVY-DUTY DIE-HANDLING TRUCKS—The Elwell-Parker Electric Co., Cleveland, Ohio. 16-page bulletin gives specifications of models ranging from 2,000 to 24,000-lb. carrying capacities.

31 MOTORIZED HAND LIFT TRUCKS—The Moto-Truc Co., Cleveland 3, Ohio. 8-page pamphlet includes information of platform, pallet and telescopic Hi-Lift Trucks. Five models are featured.

32 MOTORIZED GEAR-SPEED REDUCERS—D. O. James Gear Mfg. Co., 1140 W. Monroe St., Chicago, Ill. 120-page catalog 46-47 plastic bound, contains complete engineering data on this type of speed reduction.

PARTS and MATERIALS

33 HYDRAULIC CONTROL VALVES—Logansport Machine Co., Inc., Logansport, Ind., 32-page bulletin 86 gives information on balanced-pressure piston-type hydraulic control valves. Diagrams and specifications are included.

34 OIL SEALS—Chicago Rawhide Mfg. Co., Chicago 22, Ill. 44-page catalog 947 gives information on 12 different types of Perfect Oil seals. Specifications are included.

35 FLEXIBLE COUPLINGS—Americas Flexible Coupling Co., Erie, Pa., 24-page booklet entitled "Easier from Bearing Wear Grief," describes functions of flexible couplings, and includes discussion of stresses involved.

36 ADHESIVES—Minnesota Mining & Mfg., St. Paul 6, Minn., 28-page booklet entitled "3M Adhesives in Industry," contains 46 pictures, gives 18 case histories and lists 55 formulas. For helping in the the choice of adhesives.

37 ALUMINUM—Reynolds Metals Co., Louisville 1, Ky. 48-page booklet on aluminum sheet and plate giving mechanical properties, weights, gages, and various specifications as listed by government bureaus and professional societies.

38 PRECISION DIE SETS—Evans Reamer and Machine Co., New Lexington, Ohio. 32-page booklet gives information and specifications on the Micrez anti-friction precision die sets and companion equipment.

39 VALVES—Hauna Engineering Works, Chicago 22, Ill. 8-page bulletin 233 covers line of foot-operated valves, hand-operated valves, and speed-control valves. Specifications are given.

40 NON-FERROUS AND STAINLESS PARTS, NUTS—The H. M. Harper Co., Chicago 16, Ill. 6-page folder illustrates and describes line of non-ferrous and stainless bolts, nuts, screws, washers, rivets, nails.

41 CASTERS—Rapid-Standard Co., Inc., Grand Rapids, Mich. 60-page catalog 65-3 covers company's line of flame-hardened steel-forged casters. Illustrations and specifications are included.

MISCELLANEOUS

42 NATION ON THE MOVE!—Reductive Gear Works, Inc., Richmond, Ind. 16-page booklet in story-book style stresses importance of gears. Latter part shows pictures of gears in the making.

43 COATING PROCESSES—Harper J. Ransburg Co., Electric Coating Div., Indianapolis 7, Ind. 16-page bulletin gives information on the Ransburg electrostatic spray process. Applications are included.

44 MODERN FINANCING METHODS—C. I. T. Corp., 1 Park Ave New York 16 N. Y. 12-page pamphlet describes and illustrates with case histories the C. I. T. financing services as a means of obtaining additional working funds in any amount required.

45 TECHNICAL BOOKS—Chemical Publishing Co., Inc., Brooklyn 2, N. Y. Catalog, 1948 edition, lists technical books on chemistry, physics, science, technology, petroleum, engineering manuals and other subjects.

46 EMBLEMS—American Emblem Co., Ulen, N. Y. 36-page booklet gives complete story of The American Emblem Co., Inc., including facilities and history.

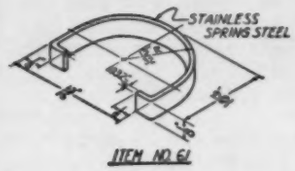
47 FORGINGS FOR FUNISHED PARTS—American Forge Div., American Brake Shoe Co., Chicago 4, Ill. 36-page catalog shows production of forgings by both upsetter and drop-hammer methods. Company's equipment for metallurgical study is also stressed.

48 MOTION PICTURES, SLIDE FILMS—Westinghouse Electric Corp., Pittsburgh 30, Pa. 24-page booklet B-3068 gives descriptions of Westinghouse sound motion pictures and slide films available for industrial and civic use.

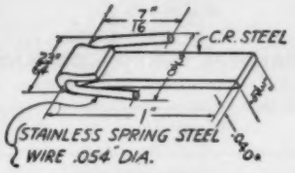
49 FORMULAS FOR STRESSES AND DEFLECTION IN CIRCULAR FLAT PLATES—Stechnardt Metal Corp., New Rochelle, N. Y. 18-page bulletin 20, entitled "Formulas for Computing Maximum Stresses and Deflection in Circular Flat Plates, contains tables, charts, and formulas evolved and simplified for direct application.

Can you make these parts by the millions?

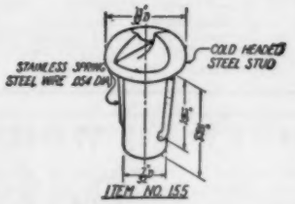
IF SO, GET IN TOUCH WITH US



ITEM NO. 61



ITEM NO. 157



ITEM NO. 155

Dimensions are typical for one size. Other sizes of each item are required.

Item 155 is similar to cold-headed rivet, cross-drilled and laced with stainless steel spring wire. This item may be made from flat strip steel on eyelet machine by blanking, drawing and forming into hollow stud.

SIMMONS FASTENER CORPORATION

P. O. Box 1230, Albany 1, N.Y.

Tel. 4-5178

PHILLSOLV

PHILLIPS

Rotomatic Vapor Degreaser

CONVEYORIZED PERFORMANCE!

Controlled cleaning Cycle!

Open top degreaser cost!

Timed for proper cleaning!

75% reclamation of solvent!

Great economizer of labor!

No installation costs!

PHILLSOLV . . . the perfect cleaning solvent for all metals or combinations of metals. PHILLSOLV will not affect or stain highly polished surfaces.

ENGINEERED SERVICE

Send for FREE Booklet "Questions and Answers on Vapor Degreasing"

PHILLIPS MANUFACTURING CO.

3467 W. TOUHY AVE. CHICAGO 45, ILLINOIS

The Lyon

INTERNAL GROOVING TOOL

Its versatility saves costly preparation time — provides precision grooving of single or multiple grooves at a production rate— plus economy of set-up time — and low initial cost. The LYON has been designed for making internal grooves to tolerances of .001" using any drill press, turret lathe, radial drill or automatic equipment.

By changing only bushings and cutters within the tool model range, you have at your command a wide variety of bore sizes and shapes. A simple adjustment regulates location and depth of groove. Work cannot be scratched or marred because the head of the tool does not turn when the cutter operates.

Our Engineering Department will welcome the opportunity of discussing any grooving problem without obligation.

LYON MACHINE CO., WORCESTER 3, MASS.

CONTRACT WORK

KAMIS Engineering Company

Designers & Manufacturers of Tools & Machinery

Special machine work; facilities available for production quantities of small, medium and large machined parts, assemblies and fabrications. Specializing in stainless steel aviation gas turbine parts.

Send for Brochure No. 3 which describes our facilities in detail.

300 MOORE STREET
PHILADELPRIA 48, PA.

Very best facilities for

STAMPINGS

IN SMALL LOTS

DAYTON ROGERS
Manufacturing Company
Minneapolis [7], Minn.

THESE MACHINES CAN BE WORKING FOR YOU ON TOOL WORK— ON PRODUCTION WORK

Cyl. Grinders — Milling Machines
Surface Grinders
Lathes — Jig Boring Machines

Save Time and Money by Putting Your Work on Our Machines

Write us for complete description of facilities available to you.

F. T. GRISWOLD MANUFACTURING COMPANY
305 W. Lancaster Ave., Wayne, Pa.

THREAD GRINDING
Accurate Lead — Send Print
Universal Thread Grinding Co.
579 Lafayette St., Bridgeport, Conn.

We Specialize in
STEEL
Also run brass, aluminum and Core iron. 1-16" to 1 1-8" dia. capacity. Brown & Sharp and Davenport automatics. Send print or sample for prompt quotations.
BELLEPOINT MACHINE CO.
Delaware, Ohio. Box 42

PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us – we will take care of them.
GENERAL PATTERN WORKS
2233 Buck Street — Cincinnati, Ohio

PUT YOUR IDLE CAPACITY TO WORK

Hundreds of metal-working companies are finding profitable business today outside their regular lines. Tell metal-working America—the 100,000 readers of AMERICAN MACHINIST about your facilities—WRITE FOR RATES.

***CONTRACT WORK DEPARTMENT*—AMERICAN MACHINIST**
330 W. 42nd STREET — NEW YORK 18, N. Y.

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EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATES

(Not available for equipment advertising)

60¢ per line, minimum 4 lines. To figure advance payment count 5 average words as a line.
POSITIONS WANTED (full or part-time individual salaried employment only), ½ above rates.
PROPOSALS, 60 cents a line an insertion.

INFORMATION

BOX NUMBERS in care of any of our New York, Chicago or San Francisco offices count 1 line additional in undisplayed ads.
DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED RATE:

The advertising rate is $8.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.
AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches to a page. A.M.

NEW ADVERTISING received by 10 A. M. April 20th will appear in the issue of May 6th subject to limitation of space available

---

WANTED — TECHNICAL EXECUTIVE MEN

ASSISTANT TO PRESIDENT:
M.E. or E.E. Degree. Age 35-40. Plant supervision experience essential. Metal mfr. stampings and machinery. Salary.....$10,000
FACTORY MANAGER:
Prefer engineering degree. Under 45. Mfr. heavy machinery. Must have allied exp.....$9600
FOUNDRY SUPERINTENDENT:
Up-to-date plant. Grey Iron & Malleable exp. Under 45. Supervisory experience.....$7200
SUPERINTENDENT:
Young man, 33-38, who has held title on light metal mfg. Solid experience in tooling, machining, stampings.....$7200
REFRIGERATION ENGINEER:
M.E. Degree. A thorough knowledge and work experience in design of industrial and commerical equipment.....$8400

Executives, Foremen, Mechanical—Electrical—Industrial Engineers, Time Study, Process, Tool Engineers, Personnel, Purchasing Agents. Hundreds of positions open. Negotiations confidential.

O'SHEA EMPLOYMENT SYSTEM
(America's Largest)
Suite 640 Lyon-Healy Bldg., Chicago, Ill.
(EMPLOYER'S INQUIRIES SOLICITED)

CONTACT MAN

Wanted by medium size Tool and Die Shop in Detroit, Mich. Must have own good sources for medium and large jigs, fixtures, dies and special machinery.

SW-4547, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

REPLIES (Box No.):
Address to office nearest you
NEW YORK: 330 W. 42nd St. (18)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

FACTORY MANAGER or Superintendent experienced in building tools, dies and special machinery. Old established successful concern with brilliant future. Applicant to invest in firm and serve on Board of Directors. Unusual oportunity. P-3961, American Machinist.

ESTIMATOR EXPERIENCED in tool, die and special machine work. Prefer man willing to invest in well established and promising firm. An opportunity of great potential. P-3962, American Machinist.

(Continued on page 245)

SALES ENGINEER

Gear manufacturer wants representatives for following states. Must be familiar with mechanics of precision gears.

Give complete personal and background details, reference and experience in application.

NEW ENGLAND; NEW YORK STATE
PENNSYLVANIA; MARYLAND; TEXAS
OHIO; ILLINOIS; MICHIGAN

S. W. 4544, American Machinist
330 W. 42nd St., New York 18, N. Y.

SUBCONTRACT SALESMAN

Experienced, competent, personable, neat man wanted to sell excess machining capacity of well known machinery manufacturer.

FIDELITY MACHINE CO., INC.
3900 FRANKFORD AVE., PHILA. 24, PA.

BUY FROM STOCK
Telephone
MAIN 6347-6348

FALK
MACHINERY COMPANY

18 WARD ST.
ROCHESTER 5
N. Y.

Every Item Guaranteed as Represented

ENGINE LATHES

32"x28' Bridgeford, Geared Head
32"x16' Bridgeford, Geared Head
28"x10' Davis, Quick Change Gear
26"x18' Bridgeford Geared Head
24"x36' New Haven, Motor Drive
24"x22' Lodge & Shipley, Geared Head
24"x18' American Q.C.G. Grd. Hd. 11' centers, Taper Attach. Motor Dr.
24"x12' Putnam, Quick Change Gear
24"x10' LeBlond, Quick Change Gear
20"x11' Schumacher-Boye, Q.C.G.
20"x10' American, Q.C.G.
20"x10' Hendey, Q.C.G. motor dr.
20"x8' Lodge & Shipley, Q.C.G. M. Dr.
18"x10' American Geared Head
18"x10' Davis, Q.C.G. M. Dr.
18"x8' Lodge & Shipley geared head
18"x8' Hendey Q.C.G. 49" centers
18"x7' Lehman, Q.C.G. M. Dr.
18"x6' American, Geared Head, MD.
16"x8' Hendey, Q.C.G. M. Drive
16"x6' Lodge & Shipley Geared Head
14"x8' Rockford, Q.C.G. Collets
14"x8' Pratt & Whitney, Q.C.G. Collets
14"x6' LeBlond, Q.C.G. M. Drive
14"x6' Mulliner-Endlund, M. Drive
14"x6' Hendey, Q.C.G. M. Drive
14"x6' Rockford, Q.C.G. M. Drive
13"x5' South Bend Q.C.G. 30" centers
12"x30" American, Wood Spinning
12"x5' Sidney, Geared Head
12"x5' Hendey, Q.C.G. M. Drive
12"x5' Sebastian Q.C.G. Grd. Hd. 30" Centers, Taper Attach. Motor Dr.
12"x3' Craftsman, Bench, M. Drive
11"x4' Sidney, Q.C.G. Floor Type
11"x4' South Bend Q.C.G. 20" centers
11"x3' South Bend, Q.C.G. M. Drive
10"x24" Logan, Q.C.G. (new) in stock
9"x12" Sundstrand Mfg. Type
8"x18" Rivett Precision, Bench
9"x15" Porter-Cable Production

TURRET LATHES

Morey No. 2 Geared Head, 1" Cap.
Simmons, Microspeed, 1" Cap.
W-Swasey, Univ. No. 4, 1½" Cap.
Gisholt No. 4, Univ. 2" Cap.
W-Swasey No. 2A, Univ. 2½" Cap.
Gisholt No. 5, Univ. 2½" Cap.
W-Swasey No. 3A, Univ. 3½" Cap.
Bullard 42" Vert. Turret
Jones & Lamson No. 3 Univ. Bar Feed

GRINDING MACHINES

Jones & Lamson Univ. 6x15 Thread Grinder. M. Dr. Late type.
Jones & Lamson Univ. 6x36 Thread Grinder. M. Dr. Late type.
Greenfield No. 12 Internal Hydraulic. Motor Dr.
Blanchard No. 16 Rotary Surface Grinder. M. Dr.
Brown & Sharpe No. 10 Cylindrical, 6x18.

GRINDING MACHINES

Brown & Sharpe No. 2 Auto. Surface Grinder. 6x18. Motor Driven.
Cincinnati No. 2 Univ. Tool & Cutter Grinder. M. Dr. Late type.
Cincinnati No. 1½ Univ. Tool & Cutter Grinder.
No. 1 B&S, 10x24, Univ. Cylindrical
"A" Norton, 10x18 Cylindrical
"A" Norton, 10x72 Cylindrical
"A" Norton, 10x84 Cylindrical
No. 2 Norton, 10x32 Univ. Tool & Cutter
No. 11 B&S 10x30 Cylindrical
No. 10 B&S 6x18 Cylindrical
No. 4 B&S Univ. 12x60 Cylindrical
No. 12 Greenfield, Internal Hydromatic
No. 70 Heald, Internal, Grinds 11" deep
No. 2 Cinci. 6x36 Univ. Cylindrical
No. 2 Cinci. Centerless, Motor Dr.
No. 51 Oliver, Drill Pointers, 1½" cap.
24" Blount Wet Grinder
Besley Dble. End Disc, 30" Discs
96" Seybold, Knife Grinder
Blanchard No. 16 Vertical, M. Dr.
Gorton Dble. End, 18" Discs
Pratt-Whitney 14x36 Vert. Surface
Abrasive No. 33 Vert. Surface, Automatic
No. 2 B&S Face Grinder, M. Drive

MILLING MACHINES

Kent-Owens No. 2-20 Hydr. Horiz. Mill. Motor Dr.
Cincinnati No. 2 Univ. Horiz. Mill. Turner Dr.
Kempsmith No. 2 Plain Horiz. Mill. Turner Dr.
Kempsmith No. 1 Plain Horiz. Mill. Motor Dr.
Milwaukee No. 2B Dble. Overarm Pl. Mill. S. P. Dr. Braces & Arbor
Milwaukee No. 2B Univ. Dble. Overarm Mill. S. P. Dr. Equipment.
Cincinnati No. 3S Univ. Horiz. Mill. Vert. Attach. & M. Dr. Arbor — Equipment.
Cincinnati 18" Mfg. Plain Mill. Horiz. 18"x5"x6". Belt Driven.
Brown & Sharpe No. 12 Production Mill. Motor Drive.
Cincinnati No. 4 Vert. H. P. Mill. Motor Drive.
Cincinnati No. 5 Horiz. H. P. Mill. Motor Drive.
Cincinnati No. 3 Horiz. H. P. Mill. Motor Drive.
Cincinnati No. 3 Dial Type H. S. Vertical Mill. M.D. Equipment.
Brown & Sharpe No. 1Y Pl. Horiz. Mill.
Becker No. 5C Vertical Mill. Range 42"x12"x12".
Pratt & Whitney Duplex Mill. Turner Dr. 3-60-220
Milwaukee No. 1½ Pl. Horiz. Dble. Overarm. S.P.D. Braces—Arbor.
Van Norman No. 2 Duplex Mill. Collets & motor

Heald No. 49 Single End, Two Head Borematic. Arranged direct current motor drive. Series 200 Spindle Heads. Universal Fixture on hand feed cross slide. Complete coolant system.

PUNCH PRESSES

Clearing, S.S. 200 tons Cap. 10" stroke.
Caldwell 200 tons Horiz. Hydr. Wheel Press.
Bliss No. 21 O.B.I. 35 tons, 2" stroke. M. Dr.
Bliss No. 18 O.B.I. 11 tons, 2" stroke. M. Dr.
Ferracute No. EG52 Coining Press. 150 tons.
General Flexible Power Press. 8 tons, M. Dr.
Stiles O.B.I. 14 tons, 1½" stroke.
Bliss No. 68C Dble. Action, Gap Frame.
Lucas 15 tons Power Arbor Press. M. Dr.
Hub O.B.I. 15 tons, 2" stroke. M. Dr.
Tompkins & Johnson Power Arbor Press.
McCall No. 4 O.B.I. 2½" stroke, 20 tons.

DRILLING MACHINES

Buffalo Forge 26" No. 2MS Drill. M. Dr.
Leland-Gifford 26" No. 3MS Drill. M. Dr.
Barnes 22" Sgle. Spdle. Drill. Power feed.
Natco No. 12, 20 Spdles. 3/16" Cap.
Fox No. 15, 54 Spdles. No. 1 m.t.
Minster No. 2D, Sgle. Spdle. Upright, compound table, No. 5 m.t., heavy duty
Cinci.-Bickford, 5' arm, 13" col. Radial
Fosdick, 5' arm, 14" col. Radial
Cinci.-Bickford, 6' arm, 15" col. Radial
Fosdick 4' arm, 11" col. Radial

SHAPERS & PLANERS

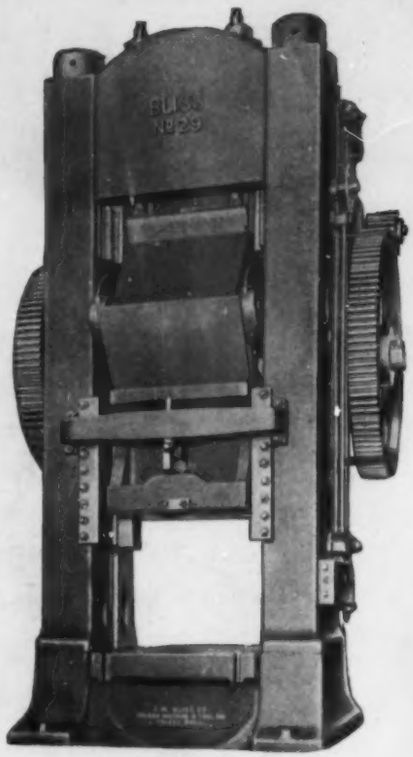
Pratt-Whitney Vert. Shaper, 6", M. Dr.
Logan 7" Horiz. Shaper, Motor Drive
Machinery Sales 16" Crank Shaper
Gould & Eberhardt 16" Crank Shaper
Gould & Eberhardt 24" Crank Shaper
American 24" Crank Shaper, Motor Dr.
New Haven 12" Vertical Shaper
Whitcombe, 24x24x6 Planer
Niles-B-P, Shaper Planer, 20x20x24
Ingersoll Planer Type Mill 30x30x16
Betts, 120"x72"x35' Planer

AUTOMATICS

No. 0 & No. 00 Brown & Sharpe Full Automatic, Standard Speed
1 — 1 1/4" Cone 4-spindle Automatic, M.D. Threading Spindle
1 — No. 515 National Acme 9/16" 4-spindle Automatics.
1 — No. 2 Brown & Sharpe Auto.

KNUCKLE JOINTED COINING PRESSES

TOLEDO - - - 667 - - - 668



Pneumatic Operated Friction Clutch

CAPACITY . . .	1200 TONS	. . .	1500 TONS
STROKE	5 "	. . .	6 "
DIE SPACE . . .	33½ "	. . .	36½ "

DOUBLE BACK GEARED

Equipped with Two Station Air Operated Dial Feed — Bottom Lift Out — And Air Operated Pickoff

IMMEDIATE DELIVERY

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Age:—Practically New!!

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EMERMAN MACHINERY CORP.

875 W. 120TH STREET — CHICAGO 43, ILLINOIS

LATE MODELS OF MACHINE TOOLS FOR EARLY DELIVERY

BORING MILLS

36" & 42" BULLARD Vert. M.D. Spiral Drive
#44 UNIVERSAL Tri-Way, Table Type

GRINDERS

6"x10"x18" THOMPSON Type "F" Hyd. Surface
12"x48" CINCINNATI Model ER Universal
#2 REID SURFACE, M.D.
12"x60" THOMPSON Type "C" Hyd. Surface
A3—10" ARTER Rotary Surface Grinder
#10 B&S, T&C, M.D.
No. 72A3 HEALD Plain & Sizematic, M.D.
No. 4T SELLERS Tool Grinder, M.D.
9" P&W Hyd. Gear, M.D.
No. 11 Blanchard Rotary, 16" chuck
4—No. 4H LANDIS 4"x18" Plain Grinders with hyd. straight infeed, hyd. timer and hyd. footstock.
6"x18" NORTON & LANDIS Type C Plain
6"x30" NORTON Type C Plain Cyli.
14"x36" LANDIS Type C Plain
24"x96" NORTON Plain, M.D.

LATHES

AMES Precision Bench Lathe, 1" collet cap., M.D.
#820 LOGAN Lathe, M.D.
14"x30" c.c. MONARCH Model C Toolroom, M.D.
14"x30" c.c. LEBLOND Heavy Duty, M.D.
16"x54" c.c. LEBLOND Heavy Duty, M.D.
16"x30" c.c. MONARCH MODEL "C" Toolroom, M.D.
16"x30" MONARCH MODEL "W" Engine, M.D. with KELLER CONTROLS
50"x17" centers LEBLOND "BIG SWING" Lathe, M.D.

MILLING MACHINES

No. 5/60 CINCINNATI Duplex Hydro., tracer control mechanism for auto. rise and fall of spindle carriers.
No. 00 CINCINNATI Hor. & Vert.
No. 2-24 CINCINNATI Auto.
No. 12-24 K&T Simplex, M.D.
No. 2G KEMP&SMITH All Geared Univ. M.D.
No. 12 VAN NORMAN Universal Miller, M.D.
No. 2H K&T Vertical, Power Feed, M.D. (3)
No. 4MS CINCINNATI Dial Type Plain, M.D.
No. 2MS CINCINNATI Dial Type, Plain, M.D.
No. M50A TAYLOR & FENN Vert. M.D.
No. 12B P&W 2-spindle PROFILER

TURRET LATHES

No. 0 B&S Wire Feed Screw Machine, M.D.
No. 2G MOREY Ram Type, M.D.
Nos. 3 & 4 GISHOLT Ram Type, Univ., M.D.
Nos. 2, 3, 4 & 5 W&S Ram Type Univ., M.D.
No. 3 J&L Ram Type Univ., M.D.
No. 4A W&S Saddle Type Univ., M.D.

DRILLS

No. 263 BARNES Heavy Duty Drill
6-spdle ALLEN 5 powerfeed spindles, belted M.D.
3'9" CINCINNATI BICKFORD "Super Service" Radial
No. 3MA6 Avey S.S. Drill, M.D.

MISCELLANEOUS

V-16 DOALL Contour Saw, M.D.

WIGGLESWORTH MACHINERY CO.

203 BENT STREET — Kirkland 7-5242 — CAMBRIDGE, MASS.

REYNOLDS
OF PROVIDENCE
Offers

#2MH CINCINNATI PLAIN MILLER

Motor in Base. 220/440-3-60 AC—Spindle Speeds 23 to 1200 RPM—New October 1942.

Very Clean Excellent Condition

A BARGAIN AT.....$3200

REYNOLDS MACHINERY CO.

305 Eddy St., Providence 3, R. I.
Tel. JAckson 8900

Norton No. 1A Engraving Machines
24"x7' centers Lodge & Shipley Lathe
14"x8' Rockford Lathe, M. D.

MONA MEMBER

D. E. DONY MACHINERY CO.
47 Laurelton Road, Rochester 9, N.Y.

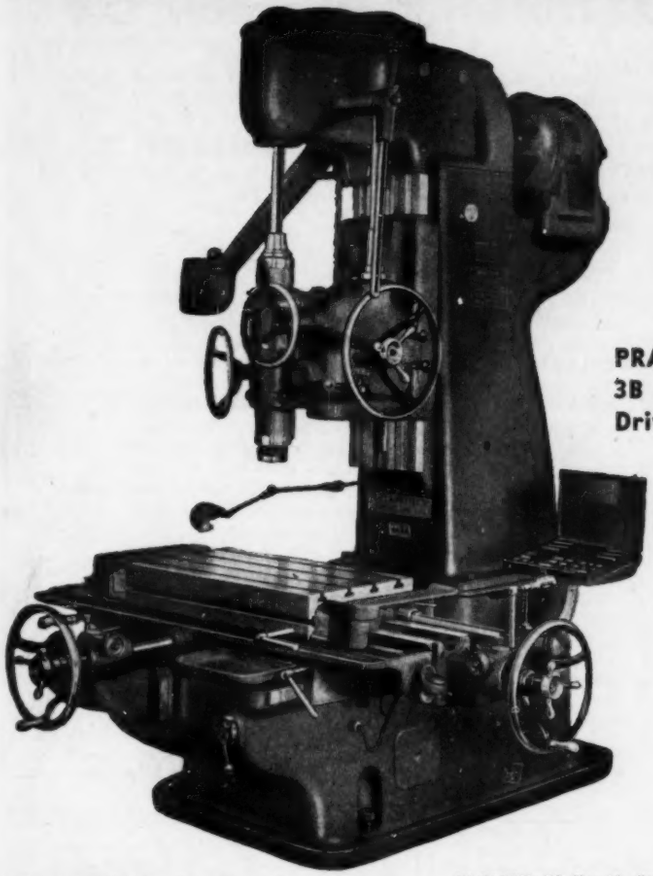
POWER PRESSES

BLISS, TOLEDO, V & O, ETC.
REBUILT – GUARANTEED

MONA MEMBER

JOSEPH **HYMAN** & SONS
Tioga, Livingston and Almond Streets
Philadelphia, Pa.

LATEST TYPE NEARLY NEW MACHINES



PRATT & WHITNEY
3B Jig Borer Motor Drive, Latest Type

BORING MILLS—Horizontal

DETRICK & HARVEY 4" bar, Floor Type
GIDDINGS & LEWIS #25, 2½" Bar, M.D.
GIDDINGS & LEWIS #32—3¾" bar, M.D.
LANDIS #35, 3½" bar, Floor Type
MORTON 60" traveling hd., combination borer, miller and driller, M.D.
NILES BEMENT POND 4½" bar, M.D.
NILES BEMENT POND 5", 6" bar, floor type, M.D.
UNIVERSAL 3" bar, latest type
UNIVERSAL Model 3A, 3" Bar, M.D.

BORING MILLS—Vertical

BETTS 120" 2 swivel heads, AC, M.D.
BETTS (Consolidated) 84"—3 heads, AC, Latest
BULLARD 16"—6 spindle Mult-Au-Matic—Type D—Single indexing—Latest Type
BULLARD 36" vertical turret, New Era Type, M.D.
KING 42" 2 Swivel Heads, Latest Type
KING 36" Vertical Turret, M.D., Latest Type
NILES 84", 100", 2 Swivel Heads, Power Rapid Traverse, M.D.

BROACHES

LaPOINTE #4L, Horiz. hyd., latest type
LaPOINTE, Vertical Surface, hyd., latest type #SRV 10-54

DRILLS

AMERICAN 5'13" Radial, M.D.
BAUSH 4—Adjustable Multiple Spindle—M.D.
CINCINNATI BICKFORD 6'15" Plain and Universal Radial, M.D.
NATCO D5, Adj., mult. spdle, latest type
WESTERN 5'18", 6'20" Radial—Latest Type

GEAR CUTTING EQUIPMENT

BARBER COLMAN #3 Hobber Precision, Latest
BARBER COLMAN #3 Hob Sharpener, Latest Type
BROWN & SHARPE No. 3H gear cutter, M.D.
FELLOWS 61, #64, 615A, 645A3, 7, 7A, 72, 77, 61A High Speed Gear Shapers, latest type
FELLOWS 12M Involute Measuring Instrument
FELLOWS Type 6Z2 Gear Shaper, High Speed, Latest
FELLOWS #13 L8 Lapping Latest Type
GLEASON #20 Spur Gear Tester, Latest Type
GLEASON 8", 12" Straight Bevel Generator, latest
GLEASON #7 Hypoid, Zerol, Spiral Bevel Generator, latest type
GLEASON 36" str. bevel gear planer, M.D.
GLEASON 11", 18" bevel generator, M.D.
GOULD & EBERHARDT 12HS Hobber, latest
GOULD & EBERHARDT 96H Hobber with DIFF M.D.
PFAUTER #1, #2 with differential, M.D.
PRATT & WHITNEY 10" Grinder, hyd., latest

GRINDERS—Cyl.—Plain & Univ.

BROWN & SHARPE #1, 2, 3, 4 Universal, Latest
BROWN & SHARPE #5 Plain, 3x12, Latest Type
BROWN & SHARPE #20, 10x18 plain, latest type
CINCINNATI 6x18 plain Model EA, hyd., latest
LANDIS 6x18, Type "C", Hyd., Latest
NORTON 16x72" plain type "C", latest type

GRINDERS—Surface

BLANCHARD #11—16" chuck, Latest Type
BLANCHARD #16—24" chuck, Motor Drive
BLANCHARD No. 16A—Dial Type—M.D.
BLANCHARD #27-18 M.D., Latest Type
GALLMEYER & LIVINGSTON #55, 15x36" hyd., latest
HEALD #22, 12" chuck, Rotary, latest type
MATTISON 12x14x60 Hydraulic, latest type
MATTISON 14x16x60 Hydraulic, latest type
NORTON 6"x18"—Hyd.—Latest Type
NORTON 10x36 Hyd., Latest Type
THOMPSON 16x30x48 Hyd., Latest Type
PRATT & WHITNEY 3B Model 4854 Latest Type
PRATT & WHITNEY 1A Motor Drive
VERNON Precision Latest Type
REED PRENTICE #5 Latest Type

LATHES—Engine and Mfg.

BRIDGEFORD 36"x32' bed—2 car., M.D.
JONES & LAMSON "Fay" 20x25" automatic TIMKEN, latest type
LEBLOND 17"x5', 20"x10' bed, Rapid Production, Timken Bearing, latest type
LEHMAN 16x30, hydratrol, Timken, latest type
LODGE & SHIPLEY 36"x144" centers, M.D.
LODGE & SHIPLEY 18"x72" centers, M.D.
LOSWING 4x60, 4x84, 8x60, 8x108, 5x34" centers, latest
MONARCH 10x20" centers, Model EE Timken, latest
MONARCH 16x28" centers, geared hed., M.D.
MONARCH 12"x30" centers, Timken, Latest Type
NILES 42"x60", double head, M.D.
NILES 48x35' centers, Heavy Duty, 2 carriage, Timken Bearing, PRT, Latest Type
NILES 48x63' centers, Combination Boring & Turning, Motor Drive
NILES 48x87' centers, Combination Boring & Turning, Motor Drive
NILES 60x10', 35', centers, 1 or 2 carriages, Timken Bearing, PRT, Latest Type
NILES 72"x62', centers, combination Boring and Turning, M.D.
NILES 30x50' Boring, Timken, Latest Type
REED PRENTICE 16x24" centers, geared hd., M.D.
SPRINGFIELD 16"x30" centers, Timken, Latest Type
SPRINGFIELD 16x43" centers, geared hd., M.D.
SPRINGFIELD 16x24" centers, geared hd., M.D.
SUNDSTRAND 8x15", stub, automatic, TIMKEN latest type
WARD HAGGAS & SMITH 18/36"x10' bed, Gap

LATHES—Turret

BARDONS & OLIVER #5, #7 Timken, latest
CINCINNATI ACME No. 1, Latest Type
GISHOLT #3, 4, 5 Univ., Timken, Latest
GISHOLT #1L, #2L, Universal, Timken, Latest Type
JONES & LAMSON #3, 8A, Universal, Timken Bearing, Latest Type
LIBBY 1H-5, 5½ hole, Timken, Latest
MOREY No. 2G, No. 3, No. 4 Timken, latest
POTTER & JOHNSTON #5D2E, TIMKEN, latest
WARNER & SWASEY 3A, Universal 6" bar capacity, Timken Bearing, Latest Type
WARNER & SWASEY #5, Univ., Timken Bearing
WARNER & SWASEY #1A, Univ., Latest Type
WARNER & SWASEY 1A Universal Bar and Chucking Latest Type

MILLING MACHINES—Mfg.

CINCINNATI 24", 48" duplex, TIMKEN, M.D.
INGERSOLL 42x38x12' Planer type, Adjustable rail, 4 heads, AC, M.D.
INGERSOLL 32x30x12' Planer Type Slab, AC, M.D.
INGERSOLL 32x24x16' Planer Type 2 heads, AC, M.D.
SUNDSTRAND Model 3A Duplex, Latest Type
TAYLOR & FENN M-80 Duplex, Spline, latest type

MILLING MACHINES—Plain

BROWN & SHARPE 2B, 3B, Timken, Latest
BROWN & SHARPE #12 Timken Bearing, latest
CINCINNATI #3, 4, Timken Bearing, M.D.
CINCINNATI #3, 4S, 5, M.D.
CINCINNATI 4-36 Hydromatic, latest type
CINCINNATI 0-8 Automatic rise and fall, Timken, Latest Type
KEARNEY & TRECKER #3, 4 heavy, Timken, latest
KEARNEY & TRECKER 1218, simplex, TIMKEN latest type
KEMPSMITH #2, #4 Maxi-Mill, Timken, latest
SUNDSTRAND #2 Electro-Mil Timken, Latest

MILLING MACHINES—Vertical

CINCINNATI No. 3, No. 4 High-Powered, M.D.
CINCINNATI #2, 3, 4, Dial Type, Timken, latest type
GORTON 8D high speed with duplicator, latest type
REED PRENTICE #5 die sinker, latest type
REED PRENTICE 3VG with Hydraulic Duplicator, Timken Bearing, latest type

PLANERS

CHANDLER 36x36x20', 4 heads, AC, M.D.
CLEVELAND 48x28x6' Openside 3 heads, M.D.
DETRICK & HARVEY 84x84x18', 4 heads, AC, M.D.
DETRICK & HARVEY 48x48x16', 4 heads, Hyd.
GRAY 36x36x8', 2 heads, maximum duty, DC, M.D.
NILES BEMENT POND 48x48x16', 2 heads, AC, M.D.

PRESSES

OHIO 42x42x20'—2 heads, AC, M.D.
BIRDSBORO 325 ton, vert, hyd., Latest Type
CHAMBERSBURG 50 ton, vert, hydro-pneumatic
CHAMBERSBURG 200 ton, horiz. straightening, M.D.
CLEARING Type DS-1125-32 dbl. action 125 ton, Latest Type
FERRACUTE #DG-55, 75 ton drawing, Latest Type
GLEASON 15 ton Quenching, M.D.
HANNIFIN 15 ton moulding, Latest Type
NIAGARA #3 inclinable, M.D.
NILES 200 ton Horizontal Wheel, M.D.
TAYLOR & FENN #11A spring, Latest Type
TOLEDO #2 inclinable, M.D.
WATSON & STILLMAN 20 ton hyd., straightening, Latest

SCREW MACHINE—Automatic

BROWN & SHARPE #4, 1¼" capacity, latest type
GOSS & DeLEEUW 6"x6¾" 4 spindle chucker, latest
NATIONAL ACME 9/16, 5 spindle Model D, M.D.

SHAPERS

CINCINNATI 32" Universal Latest Type
LAMAIRE 18" Vert. Hydraulic—latest type
LYND FARQUHAR 20" Openside, M.D.
MOREY 10", 14" Vertical, latest type
PRATT & WHITNEY 6' 10" Vertical, M.D.

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MORTON 60" combination traveling hd., planer, miller and borer, M.D.
PRATT & WHITNEY "Keller" Type G, Type BL2416 —Latest Type

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12"x36" NORTON — Universal — MultiPurpose — Type C — 1941

#2 CINCINNATI — Tool & Cutter — Plain — 1942

#2 CINCINNATI — Centerless — "Filmatic" — 1941

#2 BROWN & SHARPE — Surface — 6"x18" — 1943

LATHES AND TURRETS

12"x36" MONARCH — CKK — equipt. — 1941

14"x30" REED PRENTICE — AA — GH — 8 spd. — 1942

14"x30" LODGE & SHIPLEY — 12 Speed — 1941

14"x54" REED PRENTICE — AA — GH — 16 spd. — 1942

#3 WARNER & SWASEY — Universal Turret — Chkg — 2 spd. mtr. — 1942

#2 BROWN & SHARPE — Wire Feed — Hand Screw — 1942

MILLING MACHINES

#2 BROWN & SHARPE — Plain Horiz. — Light Type — 1943

#2 BROWN & SHARPE — Plain Horiz. — 1942

#2K K & T Milwaukee — Plain Horiz. — 1943

#3K K & T Milwaukee—Plain Horiz. — 1943

#7B FRAY — Vertical Universal—Back grd. — 1942

#2H K & T Milwaukee — Vertical — 1942

#3H K & T Milwaukee — Vertical — 1942

#1 UNITED STATES — Hand — 220/3/60 — 1942

PRESSES

#3B STANDARD — 25 Ton — OBI — Roll Feed — Equipt. — Like New

#22 BLISS — 50 Ton — OBI

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DRILL—Fosdick—3'—Radial—Square Column—BD
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GRINDER—Heald—#60—Cylinder—SPD
GRINDER—Norton—Cam—10"x24"—Mtzd.
LATHE—Hendey—14"x6'—Geared Head—Factory MD
LATHE—Monarch—14"x8'—Engine—BG—Mtzd.
LATHE—Warner & Swasey—#2—PF to Turret—Arr. MD
MILLING ATTACHMENT—Fray—#3—BG—Vertical—220/3/60
MILLING MACHINE—Milwaukee—#1—Mtr. in base—Plain Horiz.
MILLING MACHINE—Milwaukee—#2—Plain Horiz.—220/3/60
MILLING MACHINE—Garvin—#21—Plain Horiz.—BD
PLANER—Whitcomb—24"x24"x8'—Arr. for MD.
PROFILER—Pratt & Whitney—#13—Gear Driven
SAW—Cochran Bly—#4B—Ins. tooth—MD—220/3/60
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TUMBLING BARREL—Globe—16"x22"—Round—Steel.
SCREW MACHINE—Brown & Sharpe—#0—Fully Auto.—BD
SCREW MACHINE—Brown & Sharpe—#0G—Ser. No. 7500
SCREW MACHINE—Brown & Sharpe—#00G—Ser. No. over 11,000
SCREW MACHINE—Acme—single spindle—3"—Automatic
SHAPER—American—28"—SPD—Back Geared
SHAPER—Gould & Eberhardt—24"—Crank—4 Spd. Drive.
SHAPER—Stockbridge Type—16"—Crank—CD
SHAPER—Logan—7"—Floor Type—NEW
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No. 3 Waterbury-Farrel punch press, app. cap. 20 ton, stroke 2½", ram adjustment, 60 strokes per min., shutheight 6½", bed size F to B 10½", R to L 14½", 1 HP motor, like new....$475.00

No. 6600 Waterbury-Farrel punch press, cap. 56 ton, vertical back geared, open back, straight sided, 6" stroke, 60 strokes per min., 20" shut height, distance between uprights, 46", bed size 10"x45", 5 HP motor, push button switches, V drive, late type....$1750.00

No. PG-6 Ferracute punch press, geared, 1¾" stroke, bed area R to L by F to B 34¾x23. Opening in bed R to L by F to B 16x14. Slide adjustment. Height Overall 103" $2750.00

U. S. Multimiller, model MM-1-5-2. Table 6"x21½", automatic vertical motion of spindle head 2", horizontal adjustment of spindle assembly 2¼", motorized, automatic lubrication system, Coolant pump and tank, little used late model machine $750.00

No. 5 Waterbury-Farrel blanking and cupping press, 4" stroke, open back, 25"x12" bed area, app. 20 ton cap., adjustable ram, ½ HP motor.....$380.00

No. 35P Toledo punch press, gap type, flywheel 48"x7", bed size 27"x18", stroke 1¾", 15" from bed to bottom of ram ways, 10 HP motor, Pitman strap and eccentric just rebuilt.....$1500.00

Model RA-6, six-spindle Acme-Gridley automatic, 9/16" bar cap., including tooling and equipment, serial No. 2237A, practically new $3950.00

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Millers, Vertical No. 3 B and S and No. 4 Cin.
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REBUILT TO FACTORY STANDARDS OF ACCURACY

ENGINE LATHES

10"x20" centers Monarch EE Geared Head, m.d. in base, late
12"x6' Lodge & Shipley, m.d. in base, taper
13x30" centers Pratt & Whitney, m.d. in base, taper
13"x48" centers Pratt & Whitney, m.d. in base
14"x30" centers American Pacemaker, m.d. in base, latest
14"x30" centers Lodge & Shipley, m.d. in base, very late
14"x6' Hendey Geared Head, m.d., taper
14"x6' Pratt & Whitney, cone
14"x6' Sidney Geared Head, m.d. in base
14"x8' Pratt & Whitney, cone
15"x6' LeBlond Geared Head, m.d., Timken
16"x36" centers Pratt & Whitney, m.d. in base, taper
16"x6' Bradford, cone
16"x6' Hendey Geared Head, m.d.
16"x6' Lodge & Shipley Geared Head, m.d.
16"x6' Monarch Geared Head, m.d. in base
17"x6' LeBlond Geared Head, m.d.
18"x54" centers American Geared Head, m.d. in base
18"x8' American Geared Head, m.d.
18"x7' Hendey Geared Head, m.d.
18"x8' Bradford, cone
18"x8' Champion, cone
18"x8' Hendey Geared Head, m.d., taper
18"x8' Lodge & Shipley, cone
18"x8' Whitcomb-Blaisdell Geared Head
18"x12' LeBlond, cone
19"x10' LeBlond Geared Head, m.d.
20"x8' Cisco, cone
21"x18' LeBlond, cone
22"x70" centers Greaves-Klusman Geared Head, m.d., taper
22"x8' Lodge & Shipley, cone
23"x12' LeBlond Geared Head, m.d., taper
24"x10' American, cone, taper
24"x10' Greaves-Klusman Geared Head, m.d.
24"x10' Hendey Geared Head, m.d.
24"x10' Lodge & Shipley
24"x12' LeBlond, cone
24"x14' Boye & Emmes, cone
24"x24' American, cone
25"x10' LeBlond, cone
30"x12'6" Niles-Bement-Pond, variable speed m.d.
30"x13'6" Niles-Bement-Pond, variable speed m.d.
36"x12' Lehmann Hydratrol Geared Head, m.d., taper, very late
36"x21' centers Putnam Geared Head, m.d.
36"x32' centers Putnam Geared Head, m.d.
36"x36'6" bed Niles Heavy Duty, m.d., latest
50"x204' centers LeBlond Heavy Duty, m.d., taper, latest

AUTOMATICS

4 spindle 7/8" Model R-4 Acme-Gridley, m.d., bar
4 spindle 7/8" Cleveland Model M, m.d., bar
4 spindle 2" Cleveland Model M, bar, m.d.
4 spindle 2¼" Cleveland Model K, m.d., bar
2¼" Gridley, m.d., bar
2¼", 2½", 4¼", 4½", 5½", 6", 7¾" Cleveland Model A, m.d., bar
No. 6A Potter & Johnston, m.d., chucking
No. 6C Potter & Johnston, m.d., chucking
14" Fay, m.d.
20x25" Jones & Lamson, m.d.

HORIZONTAL BORING MILLS

No. 45 Giddings & Lewis, m.d., 4½" bar
2½" Cleveland, m.d.
4" bar Detrick & Harvey Floor Type, m.d.
4" bar Landis Floor Type, m.d.
No. 31 Lucas, m.d., 3" bar
No. 32 Lucas, m.d., 3½" bar
No. 33 Lucas, m.d., 4½" bar
4" Niles, m.d.
4½" Niles, m.d.
5½" Niles, m.d.
10" bar Sellers Floor Type, m.d.

VERTICAL BORING MILLS

24" Bullard New Era, m.d., with side head
36" Bullard New Era, m.d., with side head
36" Bullard Spiral Drive, m.d., with side head
42" Bullard Spiral Drive, m.d., with side head
42" Bullard New Era, m.d., with side head
42" Colburn H.D., 2 swivel heads, m.d.
48" Cincinnati Rapid Production, 1 swivel head, 1 turret head, m.d.
48" Colburn, 1 swivel, 1 turret head, m.d.
48" Putnam H.D., 2 swivel heads, m.d.
54" Colburn H.D., 1 turret, 1 swivel head, m.d.
84" Niles H.D., 2 swivel heads, m.d.
100" Niles H.D., 2 swivel heads, m.d.
100" Niles Extra Heavy, m.d., 2 swivel heads, p.r.t., late type
120" Niles Heavy, m.d., 2 swivel heads
52' King, m.d., 2 swivel heads

BROACHING MACHINES

VAS-5-42 Colonial Hydraulic Vertical, m.d.
No. 4 Oil Gear, type XA, Hydraulic Horizontal, m.d.
No. 75 HP LaPointe Horizontal Hydraulic, m.d., normal pull 37½ tons, max. stroke 150"
Cincinnati Mill Broach, 10" spindle, m.d., new
No. 4 LaPointe, gear box

BALL BEARING DRILLS

Allen Bench Type, m.d.
No. ½, 1, 2 Avey, belted m.d.
No. 1B Edlund, m.d., new
No. 2B Edlund, m.d.
No. 5M—16" Fosdick, m.d., tapper
2 spindle No. 2 MA6 Avey, latest
2 spindle No. 2 Avey, m.d., p.f.
2 spindle No. 3 Avey, m.d., p.f.
2 spindle No. 3 Avey, m.d., p.f., tapper
2 spindle 21" Canedy-Otto, m.d., p.f.
2 spindle No. 3 Edlund, m.d., latest
3 spindle No. 2 MA6 Avey, m.d., latest
3 spindle Barr, belt
4 spindle No. 2 Avey, m.d.
4 spindle No. 2 MA6 Avey, m.d., tapping, latest
4 spindle No. 2 Avey, m.d., tapping
4 spindle Gardam, belt

HORIZONTAL DRILLS

No. 1B—50" Pratt & Whitney, m.d., latest
No. 1 Pratt & Whitney 2 spindle Deep Hole, m.d.
No. 1½x105" Pratt & Whitney, m.d., latest
Pratt & Whitney Rifling Machine, belt
5 spindle Detroit Semi-Automatic, belt

MULTIPLE SPINDLE DRILLS

No. 3 Baush, m.d., 15 spindles
P7 Baush Hydraulic, m.d., 12 spindles, latest
D13H Natco Hydraulic, m.d., 6 spindles
No. 16 Fixed Center Foote-Burt, m.d.
3 spindle 12" Rockford Gang Drill, m.d.
4 spindle 21" Cincinnati-Bickford, m.d.
4 spindle Foote-Burt Rail, m.d.

GEAR GRINDING MACHINES

No. 13LS Fellows Gear Lapper, m.d.
9" Pratt & Whitney Hydraulic Spur Gear Grinder, m.d.
10" Pratt & Whitney Spur & Helical, m.d.
No. 2HS Lees-Bradner Spur & Helical, m.d.

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No. 12 Barber-Colman Double Overarm, m.d.
No. 12H Gould & Eberhardt Universal, m.d.
Barber-Colman Model T, m.d., latest
No. 34, 44 Brown & Sharpe, m.d.
No. 36H Gould & Eberhardt, m.d., with infeed attachment for worms
48" Cleveland, m.d.

GEAR CUTTING MACHINES

No. 3—26" Brown & Sharpe Spur, m.d.
No.6—60" Brown & Sharpe Spur, m.d.
3" Gleason Straight Bevel, m.d.
8" Gleason Mfg. Type Straight Bevel, m.d.
11" Gleason Straight Bevel, m.d.
12" Gleason Straight Bevel, m.d.
Gleason Spiral Bevel Rougher, m.d.
Cincinnati Gear Burnisher, m.d.
No. 1 Brown & Sharpe Spur Gear Tester
Cross Gear Tooth Rounder, m.d.
National Broach & Machine Red Wing Gear Speeder, m.d.

CENTERLESS GRINDERS

No. 2 Cincinnati, m.d.
No. 3 Cincinnati, m.d., Filmatic Spindle, long bar attachment
Cincinnati Valve Seat Grinder, m.d., cap. 3/8" valve stems

CYLINDER GRINDERS

No. 50 Heald Hydraulic, m.d., brand new
No. 6 Landis Cylinder, belt
No. 55 Heald, m.d.
No. 73 Heald Airplane Cylinder, m.d., brand new

TOOL & CUTTER GRINDERS

No. 2 LeBlond, m.d., latest
Cincinnati Monoset, m.d.
No. 3 Gallmeyer & Livingston, m.d.
Gleason Cutter, belt
No. 2B Sellers Drill, m.d.
No. 4T Sellers Tool, m.d.
3" No. 51 Oliver Drill Pointer, m.d.
Gould & Eberhardt Gear Cutter Grinder, belt
No. 05D Sellers Bench Type Drill, m.d.
Grand Rapids Tap style No. 12M, m.d.

PLANERS

Type P10 Coulter Crank Type, 1 head, m.d.
24"x24"x10' Whitcomb-Blaisdell, 2 heads, belted m.d.
30"x30"x10' Gray, 2 heads, belt
30"x30"x14' Gray, 2 heads, belt
32"x32"x16' Gray, 2 heads, belt
36"x36"x10' Cincinnati, 3 heads, m.d.
36"x36"x10' Niles, 2 heads, belt
36"x36"x18' Niles-Bement-Pond, 2 heads, reversing m.d.
36"x36"x20' Cincinnati, 2 heads, belt
36"x36"x20' Gray, 2 heads, belt
38"x38"x20' Gray, 2 heads, belt
42"x42"x26' Gray, 2 heads, m.d.
48"x48"x12' Cincinnati, 2 heads, reversing m.d.
48"x48"x12' Gray Openside, 1 rail, 1 side head, reversing m.d.
48"x48"x18' Detrick & Harvey, 4 heads, reversing m.d.
48"x48"x28' Cincinnati, 4 heads, reversing m.d.
48"x48"x32' Niles-Bement-Pond, 4 heads, reversing m.d.
48"x48"x30' Cincinnati, 4 heads, reversing m.d.
48"x48"x40' Sellers, 2 heads, reversing m.d.
56"x42"x10' Cincinnati, 4 heads, reversing m.d.
62"x62"x40' Cincinnati, 4 heads, reversing m.d.
66"x60"x40' Niles-Bement-Pond, 4 heads, reversing m.d.
72"x72"x24' Niles-Bement-Pond, 4 heads, reversing m.d.
72"x72"x36' Niles, 4 heads, reversing m.d.
96"x72"x18' Pond, 4 heads, belted m.d.

SHAPERS

16" Gould & Eberhardt, cone
24" Potter & Johnston, cone

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#22 Defiance, 2½ Table Type
#25A Defiance 3¾ Table Type
#48A Heald Single End Borematic
#49 Heald Univ. Single End Borematic
#49 Heald Single End Borematic

DRILLS

#D5 Natco Multiple
Type G Hammond Radial

GEAR MACHINERY

12" Gleason Straight Bevel Gear Generator
#13 Gleason Univ. Gear Tester
15" Gleason Quenching Press
15" Gleason Spiral Bevel Cutter Sharpener
#4 Fellows TG Thread Generator

GRINDERS

#72A3 Heald Sizematic Internal
#27A3 Heald Plain Internal
#72A5 Heald Plain Internal
16" x 16" x 48" Thompson Type C Hydraulic Surface
12" x 5" J. & L. Model TG125 Internal Thread
14" x 48" Cincinnati, Plain

NUT & BOLT MACHINERY

#2 Waterbury Farrel Automatic Nut Tapper
#9 Waterbury Farrel Screw Slotter
#33 Waterbury Farrel DSOD Header
#44 Waterbury Farrel DSSD Headers

PLANER

36" x 36" x 10' Liberty Openside

PLAIN MILLING MACHINES

#000 Brown & Sharpe Automatic
#2-18 Cincinnati Automatic
#2-24 Cincinnati Automatic
#1H-16" Kearney & Trecker Mfg.
#1230 Kearney & Trecker Simplex
#3-24 Cincinnati Plain Hydromatic
#4-36 Cincinnati Plain Hydromatic
#2SP Van Norman
#3SP Van Norman
#26 Van Norman, Ram Type
#4 Cincinnati High Power
#4 Cincinnati Dial Type, Medium Speed
#2H Kearney & Trecker
#5H Kearney & Trecker
#5HM Kearney & Trecker

UNIVERSAL MILLER

#3SU Van Norman

VERTICAL MILLERS

#2 Cincinnati Dial Type, Medium Speed
#3 Cincinnati Dial Type, Medium Speed
#4 Cincinnati Dial Type, High Speed
#2K Kearney & Trecker
#4K Kearney & Trecker
#2 Standard Brown & Sharpe

TURRET LATHES

#2A, 3A, 4A Warner & Swasey Geared Head
#2 Warner & Swasey Electric Head
#3 Warner & Swasey Geared Head
#4 Warner & Swasey Geared Head
#3 Gisholt Geared Head
#5U Foster, Geared Head
#7A Jones & Lamson Geared Head

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Drills—Large selection, single and multiple spindles also bench types, many of them new.
Gear Cutters—Brown & Sharpe No. 3—26", Gould & Eberhardt 42".
Grinders—Cylinder B & S No. 11, Planer type 16"x36", Surface 13"x63", also new (small) Universal bench and floor type. All with coolant, motorized.
Lathes—14"x6' 8', 10'—16"x6', 8', 10'—18"..6', 8' 10'—26"x16'—all cone drive, several motorized also (new) 18"x8' and 10' geared head, motorized.
Large stock 10" and 18" bench and floor type.
Planers—Single head 24"x6', 24"x8', 26"x8'.
Shapers—16", 20", 24", B.G. crank.
Turret Lathes—J & L 2"x24"—3"x36" also Acme, W & S Turret (vertical) boring and facing mills, 5 hole turrets, 30", 40".
SPECIAL—New totally enclosed dust ,proof, fan cooled, ball bearing saw arbor motors, plain shafts to size or threaded, and with collars, measures only 3¼" from center of shaft to flatted top (1 h.p. to 15 h.p.) 2 or 3 phase, 3600 r.p.m.
WOOD WORKING MACHINERY—A very large stock of new and re-built, practically all motorized. New Motorized overhead cut-off and miter saw for wood, plastics, steel, aluminum and other metals. The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. .What we have today may be sold tomorrow, so a list is really not dependable.
Drill—Foote-Burt No. 25 24" HI Duty 3" capacity in steel, motor attached.
PATTERN MAKING MACHINERY—42"x 16' bed wood lathe, compound rest, rack and pinion feed to carriage; 16" heavy duty jointer, extra long bed, front table tilts for giving draft to pattern work; tilting able also tiling arbor rip and cut-off saws; band saws; jointer; floor and bench type trimmers; and also many other machines for pattern work.

THE OSBORNE & SEXTON MACHINERY CO.
P. O. BOX 88, COLUMBUS 16, OHIO

PRESSES

60 ton. Dbl. Crank, 5" stroke, 48x24 bed, late model Waterbury Farrell (15).
200 ton 32" stroke, 27x27 bed, Bliss, 43'.
#56 Toledo, 4" stroke, 21x21 bed, 15½" shut height.
35 ton, 4, 5, 6" stroke, latest type, pract. new, w/all accessories, Bliss $850.00 ea.
70-85 ton 4" stroke, 21x27 bed, 110 strokes per min., Bliss, latest type.
90-125 ton, 4½" or 5½" stroke, 60, 80, 110 (optional) strokes per min., late Type
Inclinable, Walsh, new, 20 to 70 ton, immed. delivery from stock.

AUTOMATICS, LATEST TYPE

9/16 RA6 Acme Grid., $3800.00
1⅝ RA6 Acme Grid., $5500.00
2" RA6 Acme Grid., $7100.00
2¼ Cone, 6 Spdl., $6800.00
16" 8 spdl. Bullard Multaumatics, pract. new, $9000.00 ea. (5), with some tooling.
12" 8 spdl. Bullards, late type, lots of tooling.

HORIZ. BORING MILLS, TABLE TYPE, LATE DESIGN

5" Sellers, 84x48 tbl., 10' face plate to outer support.
3" Bar De Vlieg 6' bed
3" Bar Univ. 6' bed

PAUL'S MACHINERY COMPANY
6111 Vermont Avenue
Detroit 8, Michigan
TYLER 7-6300

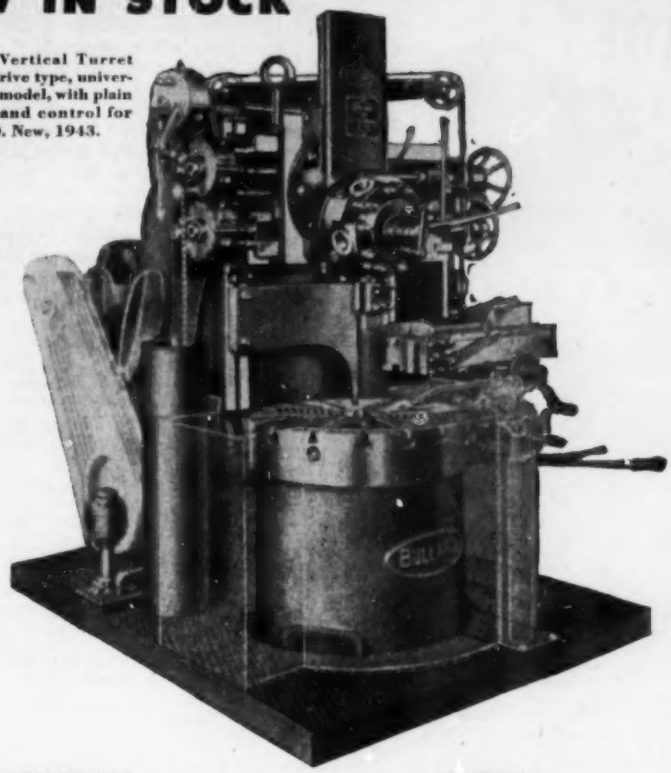
FOR SALE — KRANE KAR

Model AX, with extra counterweight, 12,000# cap. 13'/20' telescopic boom, BUDA gas engine. Completely remanufactured—Reasonable.

B. F. WALLACE, Pt. Pleasant, Penna.

QUALITY *Machine Tools*

NOW IN STOCK



36' Bullard Vertical Turret Lathe, Spiral drive type, universal high speed model, with plain table, motor and control for 3/60/220/440. New, 1943.

AUTOMATICS

2G Brown & Sharpe, H.S. 1½" capacity. New, 1943.
9/16" RA-6 Acme-Gridley. New, 1943.
3½" RA-6 Acme-Gridley. New, 1942.
6" 4 Spindle Conomatic. New, 1942.
16" x 33" Fay Automatic Lathe. New, 1941.
★Bullard Multaumatic, six spindle Model D, single index. Late Model.

BORING MILLS

★Universal Horizontal 4" bar, table type, with facing head, rotary table, boring bars, motor and control. New, 1943.

BROACHES

No. 6-36 American Hydraulic Horizontal.
No. CPC 6-30 LaPointe Hydraulic Vertical. New, 1941.
No. CPC 6-36 LaPointe Hydraulic Vertical. New, 1943.

DRILLS

4' Dreses Radial, 11" column.
Walker-Turner Radial.
No. H3 Barnes Hydram, 8 speed. New, 1942.
42" Cincinnati-Bickford, single spindle.
No. 201 Barnes Geared Drill. New, 1943.
No. 3 Avey, three spindle, heavy duty.
KH 2 Allen, 6 spindle. New, 1943.
No. 3 Baush Multiple Spindle.
Barnes Horizontal Deep Hole, two spindle.

GEAR CUTTERS

No. 6 Gleason Gear Tester.
No. 7A, 7125A Fellows Gear Shapers.
No. 615A, Fellows Gear Shapers.
No. 12 Barber Colman Hobber.

GRINDERS

No. 2 & No. 3 Cincinnati Centerless, Filmatic spindle, 1941.
★14" x 48" Cincinnati Universal, Filmatic bearing, internal spindle. New, 1942.
No. 3 Brown & Sharpe Universal. New, 1943.
4" x 18" Landis, Type H.
6" x 18" Cincinnati, Filmatic Bearing.
10" x 72" Norton Cylindrical.
10" x 36" Landis Hydraulic. New, 1943.
No. 22 Heald Rotary Surface Grinder. New, 1943.
No. 18 Blanchard, 30" chuck. New, 1942.
★30" x 24" x 192" Mattison Hydraulic Surface Grinder. New, 1943.
16" x 16" x 48" Thompson Model C, Surface.
14" x 16" x 60" Mattison Surface.
3B Abrasive, with chuck. New, 1943.
No. 5 Brown & Sharpe Surface. New, 1942.
6" x 12" x 18" Thompson Surface Grinder. New, 1942.
No. 2B Reid Surface, for wet grinding.
No. 16CP16 Bryant Hydraulic Internal Grinder, New, 1942.
No. 75A Heald Internal. New, 1943.
No. 72A3 & 72A5 Heald Sizematic. New, 1943.
★No. 74 Heald Internal Grinder, with 6 foot extension on bed for long work, adjustable work headstock on swivel table for long tapers.

LATHES, ENGINE

Hendey 12" x 30", g.h.
Reed Prentice, 14" x 30" g.h.
Lodge & Shipley Tool Room, 14" x 54", rel. att. New, 1943.
Reed Prentice 14" x 78" Toolroom. New, 1943.
American Pacemaker, 16" x 30". New, 1942.
Reed Prentice 16" x 54". New, 1943.
Sidney 18" x 54". New, 1943.
Lodge & Shipley 20" x 48". New, 1943.
Monarch, 24" x 36", g.h.
★Bertram 28" x 240" "Timesaver," two carriages, with rapid traverse. Canadian made from Niles patterns. New, 1942.
American 36" x 12' between centers.
Lodge & Shipley 48" x154", cone driven.
Carroll Jamieson 18" x 5', C.D.
South Bend 14½" x 6'. New, 1944.
IMP Model Lo-Swing.

LATHES, TURRET

Warner & Swasey No. 4A, with chuck, 7½" hole.
★Warner & Swasey No. 2A, preselector, Cross sliding turret. New, 1943.
Jones & Lamson No. 9A. New, 1943.
Gisholt No. 2L, cross sliding turret. New, 1943.
No. 18 Acme Universal, saddle type.
B & O No. 7 Ram Type. New, 1942.
Foster No. 5 Universal, Bar feed. New, 1943.
Gisholt No. 4 Universal, Hydraulic speed selector.
Warner & Swasey No. 3 Universal. New, 1942.
Bardons & Oliver No. 3 Universal, motor in base. New, 1941.
Warner & Swasey No. 2, oversize. New, 1942.
Bardons & Oliver No. 2, bar feed. New, 1941.
Bullard New Era, VTL, 42"

MILLS

★Cincinnati No. 4 Universal, High Speed Dial Type with rotary table, vertical attachment, slotting attachment, dividing head, motor and control. New, 1942.
Cincinnati No. 2M Universal.
Milwaukee No. 4K Plain. New, 1943.
Kempsmith Maximiller Plain, No. 3.
Brown & Sharpe No. 3B Plain. New, 1943.
Brown & Sharpe No. 2B Plain.
Cincinnati No. 2MH Plain, latest model.
Milwaukee No. 2HL, plain with vert. att. New, 1943.
Cincinnati Hydrotel 28" x 60", depth & tracing.
Milwaukee No. 3H Vertical. Latest model.
Milwaukee No. 2K Vertical. New, 1942.
Milwaukee No. 2HL Vertical.
Cincinnati No. 8 and 2-18 Rise and Fall.
Cincinnati No. 1-12 Automatic.
Cincinnati No. 3-36 & 4-36 Hydromatic.
DeVlieg Supermill No. 31B.
Brown & Sharpe No. 12. New, 1942.
Whitney Hand Mill, No. 6.

MISCELLANEOUS

Jones & Lamson Comparator.
Cleveland Rigidturner, No. 616.
Racine 10 x 10 Hydraulic Saw.
Bertsch 6' x ½" Bending Roll.
No. 26F Norton Hydrolap.
No. 5B Standard OBI Press. New.
No. 8-6 Zeh & Hahneman S. S. Geared Press.
Pratt & Whitney Profiler, No. 12B.
Tapper, Leland Gifford 3' Radial, No. 3 M.T. New, 1941.
24" Cincinnati Worm Feed Rotary Table.
Douds Dovetail Machine, 15 spindle.

PLANERS AND SHAPERS

★Cincinnati Planer 48" x 36" x 40', four heads, box table, rapid traverse, D. C. Drive.
Cincinnati Planer, 42" x 42" x 20', D.C.
12" Vernon Shaper. New, 1941.
Gould & Eberhardt 16" Shaper, M. D.
Cincinnati 20" Shaper, Universal table. New, 1943.
Cincinnati 24" Shaper. New, 1943.
Smith & Mills 28" Shaper. New, 1942.
Cochrane & Bly No. 14 Vertical Shaper. New, 1942.
Pratt & Whitney 6" vertical shaper. New, 1943.

ALL MACHINES MAY BE INSPECTED UNDER POWER IN OUR WAREHOUSE

INDIANAPOLIS MACHINERY & SUPPLY CO., INC.
High Quality NEW, USED & REBUILT Machine Tools
1959 S. Meridian St., Indianapolis 6, Indiana
EASTERN BRANCH: 44 WHITEHALL ST., NEW YORK
MEXICO OFFICE: HIDALGO ORIENTE 2-535-B MEXICO D.F.

Be A Smart "Injun". Trail Industry To Botwinik's For Outstanding Machine Tool Values!

LATHES

Hendey 14"x6' Model EBM Eng. Lathe, sw. 14"", dist. betw. cens. 35". 18 spin. speeds, motor driven.

1—Flather 18"x12' QCG Motor Driven Eng. Lathe, sw. over bedl 19" dist. betw. cens. 100".

1—Flather 16"x14' QCG motor driven pan bed Eng. Lathe sw. over ways 17" dist. betw. cens. 119".

BORING MILLS

1—Yoder No. 3A Hor. Bor. Mill, diam. of bar 3", Morse Taper No. 5, dist. to outer support 72", bar trav. 24", latest type, motor driven.

2—Bullard 36" "Spiral Drive", Vert. Bor. Mill, face of turret to tbl. 34", clear under cross rail 27¼", vert. trav. of turret 26 3-8", clear under S. H. slide 16", 3 and 4 jaw chuck, approx. wght. 17,500 lbs.

1—Bullard 24" "New Era Type" Vert. Bor. Mill. capac. 26" diam., 20" high, 28" under turret face, 2 jaw chuck, coolant, M.D. weight approx. 9,000 lbs.

TURRET LATHES

1—W. & S. No. 1A Univ. Hollow Tex. Turret Lathe, hole thru spin. 3 1-8", 78 spin. speeds from 20-458 RPM, chuck capac. round stock 2 ", length turned max. 35", sw. over carriage 13"", over covers 16¾", complete with bar and chuck equip. excellent condition.

2—Foster No. 5 Univ. Ram Type Turret Lathe, latest type, AC motor driven, sw. over bed 17½", hole thru spin. 2 3-8", bar feed and chuck. equip., consid. extra tooling.

1—B. & S. No. 2 Hand Screw Mach., power feed to turret turns any length to 6" hole thru longest regular feeding finger 1"—thru spindle 1 9-16", spdle speeds 580-2485 RPM, latest type.

MILLERS

Cin. No. 5-60 Duplex Tracer-controlled Hyd. Miller, tbl. wkg. surf. 20" x 78½" cross range left hand quill 8". right hand quill 8"; vert. movement of spindle, tracer or manual control 13¾".

2—B. & S. No. 2A Univ. Mill. Machines; tbl. wkg. surf. 45" x 11 1-8"; feeds-long. 28", cross 10", vert. 18".

1—Cin. 28" x 60" Vert. Hydro-Tel Milling Machine, very latest type, tbl. wkg. surf. 28" x 83"; range: long. 60", cross 24", vert. trav. of spin. hed. 14"; power rapid trav.

3—Cin. No. 2M Constant Speed Drive, Pl. Horiz. Millers. tbl. wkg. surf, 49" x 10½", range; long. 28", cross 10", vert. 19", 12 spin. speeds, 20-419 RPM.

2—Cin. No. 3 Hor. Dial Type Millers, latest type, tbl. wkg. surf, 58¾"x15", long. feed 34", cross 12", vert. 20", spindle speeds 18-450 RPM.

5—B. & S. No. 12 Pl. Mill. Machine, motor driven, tbl. wkg. surf. 48 5-8"x 12"; feeds long. 18", cross adj. of spin. 3¼", vert. adj. of spin. hed. 10½"; No. 50 Taper, electrically controlled.

1—Cin. No. 2M motor in base, vert. Miller, tbl. wkg. surf. 37"x10½" spdle speeds 12. range 20-419 RPM, late type.

RADIAL DRILLS

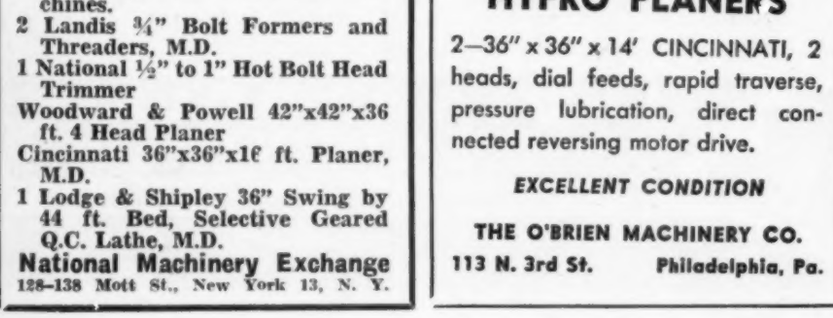
1—Cin. 3' 9" Col. Pl. Radial Drill, motor driven, 12 speeds, No. 4 Morse Taper.

SHAPERS

Fellows No. 61A Gear Shaper (rebuilt in 1945) motor in base; will cut external gears 5" face ¾ D.P., 18", internal gears 3" face ¾ D.P., 18".

Gould & Eberhardt 24" high duty Shaper, motor drive with variable speed motor, number of speeds to ram 8; 6-100 pe minute.

Write, wire or phone WOrrctster 6-5175
Complete Your Machine Tool File Send for our Catalog.



Botwinik Brothers of Mass., Inc.
3 SHERMAN ST. • WORCESTER 1, MASS.

National Bent Shank Nut Tappers —Battery of ⅝" and ⅞" Machines.

2 Landis ¾" Bolt Formers and Threaders, M.D.

1 National ½" to 1" Hot Bolt Head Trimmer

Woodward & Powell 42"x42"x36 ft. 4 Head Planer

Cincinnati 36"x36"x1€ ft. Planer, M.D.

1 Lodge & Shipley 36" Swing by 44 ft. Bed, Selective Geared Q.C. Lathe, M.D.

National Machinery Exchange
128-138 Mott St., New York 13, N. Y.

HYPRO PLANERS

2—36" x 36" x 14' CINCINNATI, 2 heads, dial feeds, rapid traverse, pressure lubrication, direct connected reversing motor drive.

EXCELLENT CONDITION

THE O'BRIEN MACHINERY CO.
113 N. 3rd St. Philadelphia, Pa.

MILES' QUALITY

Automatic, 2⅝" Acme Gridley 6 spindle, model RA6 with accelcrated reaming in 4th & 5th positions and quite a little equipment. Serial No. 84243. New 1941.

Automatic, 1⅝" New Britain 6 spindle, model 61 with several sets of collets and tooling. New 1942 or 1943.

Automatic, two 16" Bullard 6 station Mult-Au-Matics arranged for power chucking (no chucks). Two compound and three plain tool slides, extra high columns. Serial Nos. 18767 and 22,209, new in 1942 and 1943.

Automatic, 16" x 33" Fay, serial No. 82797, new in 1943. Has hydraulic chuck, front and rear tool slides and hydraulic tailstock.

Air Compressor, 1118 cu. ft., 20" & 12" x 16" Worthington "Feather Valve" duplex 2 stage, serial No. 24189. Has 195 HP General Electric 440/60/3 synchronous motor directly on shaft.

Boring Mill, 100" Niles-Bement-Pond Heavy Pattern. Two swivel heads with power rapid traverse. 35 HP, 230 volt direct current variable speed motor. Serial No. 17552.

Gear Generator, 12" Gleason straight path two tool rougher, Serial No. 20332, new in 1943. Has hydraulic work clamping and control.

Grinders, 6"x18", 10"x18", 14"x36", 16x36" & 20"x48" Landis type C hydraulic. New from 1941 to 1943.

Thread Grinder, No. 33 Excello automatic, serial No. 4459, new in 1942. Also have No. 35 Excello, universal type and about same age.

Internal Grinders, Nos. 16CP16, 16-28, 16F28 and 24-36 Bryant. All built after 1941.

Surface Grinder, 12"x16"x48" Thompson hydraulic, serial No. 4C084, new in 1941. Has 12"x40" magnetic chuck, both hand and hydraulic cross feed.

Lathe, Turret, No. 1L Gisholt saddle type universal, serial No. 27-627, new in 1942. Has air chuck, some tooling. Also have Nos. 3, 4, 5 & 3AL Gisholt.

Lathe, Turret, 36" Bullard "Spiral Geared" vertical, serial No. 19262, new in 1942. Has 3 jaw chuck table, cutting lubricant system.

Miller, Thread, Model CT-36 Lees Bradner, serial No. CT141, new in 1942. Has 13" hole through spindle.

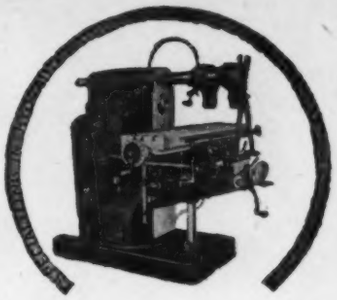
Miller, No. 28-60 Cincinnati Hydrotel vertical, single spindle with down feed and hand controls. Serial No. 1H1V1L-313, new in 1942.

Millers, Cincinnati Hydromatic, most manufactured 1942 or later. Sizes: 3-24, 4-36, 4-48, 5-48, 56-72 and 56-90.

SEND FOR COMPLETE LIST

MILES MACHINERY CO.
SAGINAW, MICH.

AARON VALUES IN MODERN TOOLS



SPECIALS

Universal 3" boring mill, new 1944

56 Ton Thomas OBI Press, New 1947

Gorton Duplicators and Vert. Millers

Gorton No. 3Z, 3L ID, ME Engravers

Marvel 6A Hacksaw, M.D., Auto. Feed

Injection Moulders, Hydraulic Presses

Bakewell No. 1 Tapper

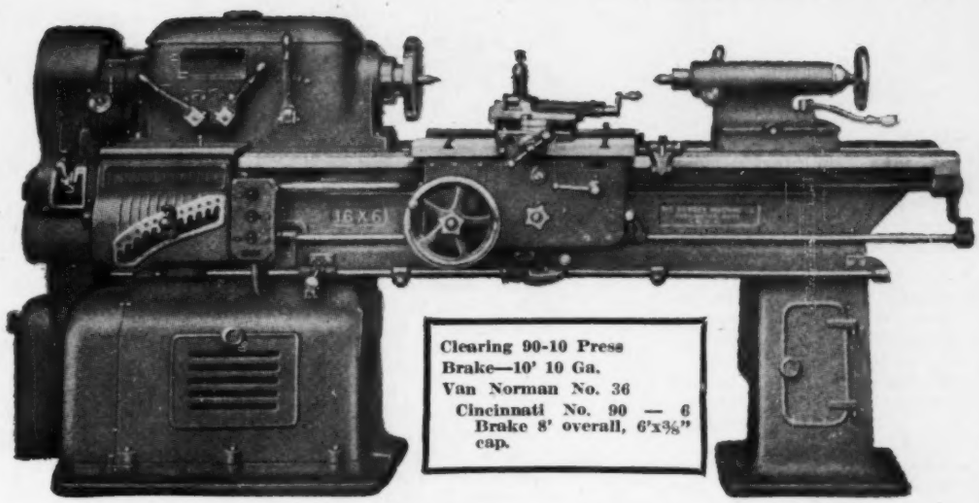
Sellers Wet Drill Grinder 6G, late

Abrasive 6x18, 8x24 Surface Grinders

Conomatic 1⅞" 8 spindle, Late Type

Brown & Sharpe #5 Grinder Cyl.

Thompson Seam Welder Mod. 26, Rafter, New 1945



Clearing 90-10 Press
Brake—10' 10 Ga.
Van Norman No. 36
Cincinnati No. 90 — 6 Brake 8' overall, 6'x3⅜" cap.

BORING MILLS

King 42", 2 HDS, M.D.
#0 Giddings & Lewis arr. M.D.
2½" Cleveland arr. M.D., 2½", 4" Binsse
Niles-Bement-Pond 4" duplex, Universal 3"
66" Niles; 54" Colburn M.D. 2 hds.
Bullard New Era 24", 42", Vert. M.D.

TURRET LATHES

W. & S. Nos. 3, 4 Grd. Hd., Preselector
Gisholt No. 1L, 2L Univ. M.D., Late
Foster Nos. 4, 5, 6, 1B, 3B M.D. Univ.
J. & L. 2¼"x24", 3¼"x36"
Acme #2 M.D.
Oster 601 Rapiduction, Late
Hardinge ESM, 2nd operation, late

GRINDERS

Abrasive 3B 8"x24" Surf., #34 Vert.
No. 18, 25, and 35 Gallmeyer and Livingston Hyd. Surface.
#25A Heald, M.D. like new Rotary Surf.
No. 2 Cincinnati Centerless M.D.
B. & S. No. 2, 2B Surface, M.D.
P. & W. 14", B.B., Vert. Surface 19"x49", 12x36"
Blanchard 30", M.D.; Modern 12x48" M.D.
Norton Hydraulic 12x18", M.D. Cyl.
Heald No. 72A3 Gagematic
Norton 50"x28' M.D. Roll Grinder
Landis Type A 6x20" Hydraulic, M.D. Cyl.
No. 50, 60, 65, 70 Heald Int., M.D.
12" Heald Rotary, Arter 12" M.D.
B. & S. No. 10, 11, Cyl.; 1, 3 Univ.
Norton 6x18" Hyd. Surface, M.D.
Covel #91A Tool, New 1941, Cinn.
Hammond & Excello Floor Model

LATHES

24"x12' Springfield Grd. Hd., late
Monarch, Hendey 12x30, 10x20 G.H. Late
26x12' Boye & Emmes 3 step cone D.B.G.
14"x6' Hendey Taper, Collets 16"x8'
9" LeBlond P&W 1"x18" Automatic
36x30' Putnam M.D., 36x22', 42x16
32"x35' Wickes, M.D.
20"x30' Boye & Emmes Grd. Hd., Late
South Bend, M.D., 9"x3'
Sebastian 12"x4' grd. hd. late
Wade, Hjorth, Hardinge, P & W Precision Bench
Rivett No. 918 bench, late M.D.
Pryibil 18" spinning

AUTOMATICS

Cone 8 spindle, 1⅞" Late
Cleveland Model A ⅞", 1¼", 2"; B 1", 2", ⅞"
Cone 4 spindle, Gridley
Brown & Sharpe #4, 6 Auto. #2 Hand

NEW IN STOCK

Power & Gap Shears—52", 72" & 96"

Spot & Arc Welders
5, 7, 14, 18 & 30 ton OBI Power Presses
Ammco 7", Shape Rite 8", Shapers
H.S. Vertical Milling Heads
Drill Presses, Foot Presses
Kalamazoo Metal Band Saws
No. 1½ Abrasive Wet Surface Grinder
6x6" Racine Hacksaw; #8 Marvel
20 ton Northern Hydraulic Presses

MISCELLANEOUS

Wiedman Turret Punch—Type R4P
Buffalo #0 Angle Roll M.D.
Bliss #58-OB Gap Presses, 62, 62A, 162
6" Vertical Shaper, P & W
10x10 Peerless Universal Shaping Saw
#7, 72 Fellows Gear Shapers
Pexto 6' Power Shears
Burke Millers, Pl. & Univ.
Delta Single & Multiple Drills
Deckel G1, G2, G1F Engraving machines
Hanson-Whitney Thread Miller
Oliver Heavy Duty die making machine
J & L bench comparator
Taylor-Winfield 50 KVA Spot Welder
Leland-Gifford 1, 2 & 4 spindles, Model MS
Peerless No. 226, U and M Eyletting
Hi Speed Hammers
Ferracute DDG-56 SS. Press

MILLING MACHINES

Cinn. #3 Pl., #4 Vert. Dial Type, Rect.
3B K. & T. Dbl. Overarm
Cleveland Vert. No. 1 M.D.; #1 Univ.
#2B K & T Univ.; No. 2A B & S Univ.
No. 3S Cincinnati, S.P.D. rapid trav.
Nos. 0Y, 2, 3, 4, 5 B & S Plain & Univ.
Hall Planetary Model D Thread Miller
Becker Nos. 3, AB, 5, 6 Vert.
No. 2, 3, 4 Cincinnati Vert.
P. & W. No. 12, 30" Profiler, M.D.
B. & S. No. 1, 3 Vert.
B. & S. #12 Elec. Prod. late type, #21
Gorton 8D, 9J, hand feed, Like new
Gorton 8D, 9J power feed, Like new
Gorton 9J Duplicator
Taylor-Fenn Spline
Van Norman No. IV, late.

HYDRAULIC EQUIPMENT

2000 TON BIRDSBORO PRESS

Self Contained

60" between rods left to right, 53" front to rear. Overall length of platen left to right 144". Stroke 30". Opening 36". 60 H.P., 3 phase 60 cycle, 220-440 V motor.

1300 TON WATSON STILLMAN HYDRAULIC PRESS (Self Contained)

Platen size 48"x42". Stroke 22". Opening 46". Ram Diameter 35". Driven by 50 H.P. motor, also.

600 TON SOUTHWARK PRESS

Self contained 48"x48" platen size, 65" stroke, 110" opening, 50 H.P. motor, 3 phase, 60 cycle, 220v.

1000 TON H.P.M. PRESS

Self Contained

Platen 72"x48". 36" stroke. 36" opening 40 H.P., 3 phase, 60 cycle, 208-416 V motor.

1140 TON SOUTHWARK PRESS

Not Self Contained

Platen 11' 11" left to right, 11' front to rear. 48" stroke. 60" opening.

All Hydraulic equipment is completely engineered and checked by a competent staff, thus assuring reliability. Send us your hydraulic problems.

RADIALS

Carlton, 19" col. M.D.
6' Cincinnati-Bickford
4', 5', 6' American Triple Purpose
Walker-Turner, ½" cap.

AAron Machinery Co., Inc.

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Make BOTWINIK NEW HAVEN Your Machinery Headquarters

Modern Machine Tools Ready to Ship
Immense Stock.....

DRILLS
Avey & Allen 3, 4, 5, & 6 Sp.
Barnes No. 262, No. 201
Cincinnati-Bickford 3', 4', 5', & 6' Radials
Carlton 4' Radial
Niles-Bement-Pond 6' Radial
LeBlond No. 2 Horiz. Rifler Hyd., M.D.

GRINDERS
Abrasive Nos. 33 & 34; No. 3B
Norton 6"x18" Hyd. Surface
Norton 6"x10"x36" Surface
Norton 15"x15"x72" Surface
Hill-Acme 18"x24"x96" Surface
Mattison 12"x16"x54" Surface
B. & S. Nos. 1, 2, 3, Universal
B. & S. Nos. 5, 10, 11, Plain
Bryant Nos. 3B, 5, 6, 12 Internal
Cincinnati No. 1½ Tool & Cutter
Cincinnati No. 2 Univ. Tool & Cutter
Norton No. 2 Tool & Cutter
LeBlond No. 2 Tool & Cutter
Cincinnati No. 2 & No. 3 Centerless
Cincinnati No. 3 Centerless Lapper
Fitchburg 36" Spline Grinder
B. & S. No. 13 Univ. & Tool, Late Type
Blanchard No. 16—30"
Heald No. 25-A Rotary Surface
Heald No. 22—12" Rotary Surface
Heald Nos. 70A & 72A Internal
P. & W. 14" Vert. B.B.
Gardner No 5 Disc

LATHES
Monarch 12"x30" CK (swings 18")
Hendey Plain 12", 14", 16", 18" Yoke Head
Hendey 14"x6' Y.H. Fact. M.D.
American 16"x6'—G.H.
Fitchburg 60"x22'
Midland No. 4 Turret
Gisholt No. 3L and No. 5
Bardons & Oliver No. 5 Turret
P. & J. No. 4D Turret

MILLERS
Milw. No. 3B
Cin. #2 Universal
Milw. No. 2B & 3B Double Overarm
B. & S. No. OY Production
B. & S. No. 3A Universal
Cin. Nos. 3, 4 Vert.
Van Norman No. 3 Sp. Plain
Becker Model C Vertical
B. & S. No. 2 Vert.
B. & S. No. 3B & 5B Plain
Kempsmith #2G Plain
Van Norman Duplex #0, #2, #20
P. & W. 8", 10", & 12" Automatic
Cincinnati 18" & 24" Production
Sundstrand No 1 18 and No. 2 Electromil
P. & W. 6" x 14" Thread
Lees-Bradner 6"x36" Thread
Cincinnati #5 M.D. Plain
LeBlond 3H Plain
B. & S. No. 12 Production
Gorton No. 9J Vertical
Kempsmith No. 4 Maximiller, Plain

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Henry & Wright 100-Ton M. D. Dieing
1000 ton Toledo Knuckle Joint
Ferracute P4
W-F 250-Ton Hobbing
Z&H 80-Ton S.S. (New)
Bliss No. 21, OBI

SCREW MACHINES
B. & S. No. 00, 0, 2 Automatic
B. & S. No. 1 & 2 Hand Screw
W. & S. Nos. 1, 2, 2A, 3A Universal
Foster No. 7 and No. 1B
Cone 1¼" & ¾" 4 Spindle
Cleveland 3¾" Model A, Latest Type
Cone 3¼"—4 Spindle

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Brand New Chicago Pneumatic, Model 327-425-3
DRILLING CAPACITY UP TO 1¼"
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15"x5' Sebastian
18"x6' American
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36"x30' Lodge & Shipley
36'—48"x16' Lehman Hydrotrol (1945)
50"x17' centers LeBlond (1942)

8"x15" Sundstrand, Model B (1942)
8"x15" Sundstrand, Model D (1943)
8"x15" Sundstrand, Model E (1942)
10"x22" Sundstrand, Model AA (1943)
12"x16" Lipe Carbo
16"x33" Fay Automatic (1942)
20"x25" Fay Automatics (1942)

MILLING MACHINES

No. 08 Cincinnati Vertical (1942)
No. 2H Milwaukee Vert. (1942)
No. 2 Cincinnati Vert. (1942)
No. 2M Cincinnati Vert. (1941)
No. 3 Standard Milwaukee Vert.
No. 3 Cincinnati Vert. High Power
24" Cincinnati Production
No. 1-18 Cinn. Mfg. (1940)
No. 2-18 Cinn. Rise & Fall (1941)
No. 2—18" Sundstrand Electromil (1942)
No. M-18 Milwaukee Simplex (1942)
No. M-24 Milwaukee Simplex (1942)
No. 2-24 Cincinnati Rise & Fall (1943)
No. 18-48 Milwaukee Simplex (1943)
No. 4-36 Cincinnati Hydromatic (1942)
No. 4-48 Cinn. Hyd. Tracer (1942)
No. 45-48 Cinn. Hyd. Plain Tracer (1942)
No. 56-90 Cinn. Hyd. (1943)
No. 2 Hanson-Whitney Thread
4"x9" Hanson-Whitney Univ. Thrd. Miller
4½"x12" Pratt & Whitney, Model C
6"x20" Pratt & Whitney, Model C
6"x36" Lees-Bradner—Model HT (1943)
6"x48" Pratt & Whitney Thrd. Miller

4" Taylor & Fenn Spline, M.D.
Ingersoll Traveling Column Miller
24"x24"x12' Ingersoll Adj. Rail
72"x48"x12' Ingersoll Adjustable Rail

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No. D-8 Colburn No. 6 M. T.
No. 2LMS—26"—2 Spdl. L.G. (1945)
No. 2LMS—26"—4 Spdl. L.G. (1942)
24"—4 Spdl. Demco
No. 2MA-6 Avey, 4 Spdl.
No. 2LMS—20"—6 Spdl. L.G.
No. 3B—24"—6 Spdl. Edlund (1942)
No. 2—8 Spdl. Leland-Gifford
7'-15" Col. American Full Universal
7'-15" Col. Carlton, Motor on Arm

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34" King
42" Bullard New Era
52" King
72" Cincinnati
72" Niles Extra Heavy
84" Betts

HOR. BOR. MILLS

No. 3A Universal, 3" Bar
Rockford, 3⅛" bar
No. 32 Giddings & Lewis, 3½" bar
No. 360-F Giddings & Lewis (1942)
No. 560-F Giddings & Lewis (1942)

JIG BORERS

Model B Kearney & Trecker Autometric (1943)

GEAR MACHINES

No. 61-A Fellows Gear Shapers (1942)
No. 712 Fellows Auto Indexing (1943)
No. 7125-A Fellows Gear Shaper (1942)

11" Gleason Bevel Gear Cutter
72" Cincinnati Gear Cutter

MISCELLANEOUS

No. 22-C Racine Shear Cut Hack Saw
No. 20 Bliss O.B.I. press
No. 0 Bakewell Tapper
Baush Tapper

TURRET LATHES

No. 2 B. & S. Screw Machine, Wire Feed
No. 601 Oster Rapiduction (1942)
No. 4 Gisholt (1942)
No. 5 Warner & Swaseys (1942)
No. 5 Bardons & Olivers (1942)
No. 5 Foster, A.C. & Bar Feed (1942)
No. 2-A Warner & Swasey
No. 1-H Libby, 6¼ Hole in Spindle (1937)
18" Libby, 3½" Hole in Spindle
No. 4A Warner & Swasey, 7½" Hole in Spindle

GRINDERS

4"x12" Landis, Model H (1942)
6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
10"x18" Cincinnati, Model ER (1942)
10"x36" Norton Type C Plain (1943)
10"x48" Norton Type C Plain (1943)
Norton Motor Driven Plain Grinders
6"x18" —— to —— 24"x240"
10"x24" Landis Type C Universal
12"x36" Landis Type LCH Universal (1945)
No. 5—8"x24" Covel Hydr. Surf (1941)
24"x24"x84" Mattison Hydr. Surf
No. 34 Abrasive Surface (1943)
No. 22—12" Heald Rotary Surface
No. 25A—24" Heald Rotary Surface (1943)
72A-3 Heald Internal Grinder
72A-5 Heald Internal Grinder
10"x72" Colonial Broach Grinder

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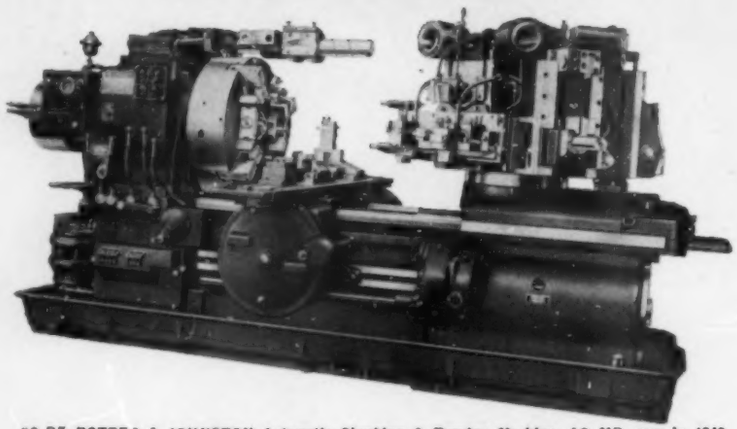

#8-D7 POTTER & JOHNSTON Automatic Chucking & Turning Machine, AC MD, new in 1943 and used very little. In Excellent Condition. Ask for complete information.

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14"x6' HENDEY Yoke Head, AC self-cont. drive, univ. relieving attach.
16"x54" ctrs AMERICAN "Pacemaker", AC MD, taper, Like New
24"x12' Boye & Emmes, Turner Drive, AC MD
14"x6' AMERICAN 12-speed Grd Hd. AC MIB, taper
14"x8' AMERICAN 12-speed Grd Hd, AC MD, taper
16"x6' SEBASTIAN Grd Hd, AC MIB, taper, new 1943
17"x8' SIDNEY, Lima Drive, taper
20"x6' SEBASTIAN Model R, AC MIB, new 1947
20"x8' LODGE & SHIPLEY Selec Grd Hd, AC MIB, taper
20"x10' AMERICAN Grd Hd, AC MD, taper
22"x10' ROCKFORD, 3 SCD DBG QC
24"x14' LODGE & SHIPLEY, Turner drive, taper
27"x10' GREAVES-KLUSMAN, 3 SCD DBG, QC

MILLERS

#40H INDEX Vert., PF to table, AC MD
#14 COCHRANE-BLY Univ. Vert. Miller & Shaper, AC MD
#1M CINCINNATI Plain, Rect O.A., SPD
#1 CINCINNATI Univ., 4 SCB BG
#2 CINCINNATI H.P. Plain, AC MD
#2B BROWN & SHARPE Heavy Plain, AC MD, PRT
#2B MILWAUKEE Plain, DOA, AC MD
#2B MILWAUKEE Univ., DOA, SPD
#2M CINCINNATI Plain, Rect O.A., AC MIB
#4B BROWN & SHARPE Plain, AC MIB, DOA
#4 CINCINNATI Univ. H.P., Lima Drive

SHAPERS & PLANERS

14", 16", 20" & 24" GOULD & EBERHARDT H.D.
30"x30"x8' CINCINNATI, AC MD
36"x36"x8' GRAY Extra Hvy Pat. 3 hds, MD
36"x36"x16' GRAY, 4 hds, AC MD
24" MILWAUKEE V-ram, Lima AC MD
28" AMERICAN H.D., arr AC MD
24"x24"x6' CINCINNATI, AC MD
42"x42"x10' LIBERTY Openside, AC MD, 2 hds, Aux. Table

RADIAL DRILLS

2' & 3' AMERICAN Triple Grd, gearbox
4' MORRIS, MD
6' CINCINNATI-BICKFORD, mtr on arm
7' DRESES, AC MD thru gearbox

GRINDERS

#16—26" & #16—30" BLANCHARD Vert. Spdle, AC MD
#2 BROWN & SHARPE Univ., factory AC MD
#2 BROWN & SHARPE Surface, with chuck
#4 GARDNER BB Disc, 23", AC MD, new 1942
#24—53" GARDNER Vert. Spdle Disc. arr MD

TURRET LATHES

4W CINCINNATI-ACME Univ., AC MD, threading attach.
#5 WARNER & SWASEY Univ., AC MIB
#2B FOSTER Univ. Grd Hd, SPD
#3 ACME Univ., AC MD
#3A WARNER & SWASEY Univ., AC MD, Timken
#4 WARNER & SWASEY Univ., AC MIB, Timken

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48"x48"x24' Gray Planer, 1942
42"x18"x16' N.B.P. Frog & Switch Planer, 50 h.p. A.C., M.D.
84" King Vert. Boring Mill, 1942
7' Carlton 17' col. Radial, 1943
3½" bar Cinci. Gilbert Table Type Mill, 84" spin. to outer support, 42" spin. to table, 1943
22"x120" centers Monarch Lathe, 1944
36"x32' N.B.P. Lathe, 2 carr., T.A.
No. 3K Kearney and Trecker Vertical Miller, 1942
No. 2MH Cincinnati Universal Miller, 1944
No. 3 W. and S. Univ. Turrets, bar, late (3)

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FLASH WELDER, 200 KVA, SWIFT
FORMING ROLL, Farnham, 12'
THREAD MILLERS: Lees Bradner Model CT
AUT. CHUCKERS, #412 NEW BRITAIN GRIDLEY 4 Sp.
SHAPER, American 18"
PLAIN MILLING MACHINE, LeBlond #3
P&W Hor. Deep Hole Drill 2 sp. size #1
CHIP CRUSHER, AMERICAN #1700
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Grinder, Surface, 18"x48" Thompson MD.
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Lathe, 10"x4' So. Bend Toolroom, TA; MD.
Lathe, 12x30" Hendey GH; MD. chuck.
Lathe, 13x36" Regal GH., MD. chuck.
Miller, 36 Van Norman, MD. Index, Rot. table.
Miller No. 4 Burke, MD, Index, Vert. Att.
Miller Mfg. 2-24 Cin. Rise & Fall, MD
Miller Mfg. No. 12 Brown & Sharpe, MD.
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38 Ton	3", 3½", or 4"	Immediate
55 Ton	3" or 3½"	Immediate
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All Presses Complete with Drive, Motor, Counting and Safety Devices.
Roll Feeds For All Presses.
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36"x12'-5" centers Lodge & Shipley GH
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3" Universal Horizontal Boring Mill
24" Bullard NEW ERA Vertical Turret Lathe
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BORING MILLS, Vert. 24", 36" & 42" Bullard
BORING MILL, Vert. 14' Niles, 2 hds., m.d.
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DRILL, Hyd. No. 15 HC Fox, 24 spdl., #2 m.t.
GEAR HOBBER, 36-H Gould & Eberhardt, m.d.
GEAR SHAPER, #75 Fellows, 6½" helical
GRINDER, Int. No. 72-A5 Heald Hydraulic
GRINDERS, Plain, Hyd., 14"x36" Norton
GRINDERS, Surf. Nos. 3 & 5 Abrasive
GRINDER, Surf. Rotary No. 25 Heald
HAMMER, Pneumatic, No. 6-B Nazel
LATHES (3) 18"x10' L & S, 12 Speed Grd. Hd.
LATHE, 24"x16' Boye & Emmes, Grd. Hd.
LATHE, 38"x19' Putnam, Q.C.G., T.A., Grd. Hd.
MILLER, Hor. Newton with vert,. spdl., tbl. 20"x17'7"
MILLER, Pl. No. 3, 3S, 4 & 5 Cincinnati
MILLER, Planer, 48"x36"x16' Ingersoll, 4 hds., m.d.
MILLER, Univ. No. 4 Cincinnati, Vert. Att.
PLANER, Openside, 36"x36"x10' Liberty, 2 hds.
PLANER, Openside 72"x72"x24' D & H
PLANER, Openside, 108"x96"x24' D & H
PLANER, Hydraulic, 48"x48"x14' Rockford, 4 hds.
PLANER, 72"x72"x12' N-B-P, 4 hds., m.d.
PLANER, 128"x96"x30' Simmons, 4 hds., m.d.
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8'6"/15'9"-6"x35' Detrick & Harvey Convertible Openside, double deck, 3 ways, 100 HP, DC
48"x42"x12' D. & H. Openside, one rail head, one side head, self-contained Motor Drive.
60"x60"x16' Cleveland Openside, 2 heads, AC or DC self-contained drive

DOUBLE HOUSING

16'x12'—9"x35' N-B-P Heavy, Variable Voltage Drive, 4 heads, 125 HP AC
136"x96"x24' SIMMONS, 4 heads, box table, P.R.T. New 1943

72"x72"x18' N-B-P Heavy, 4 heads, P.R.T. 230 V. DC
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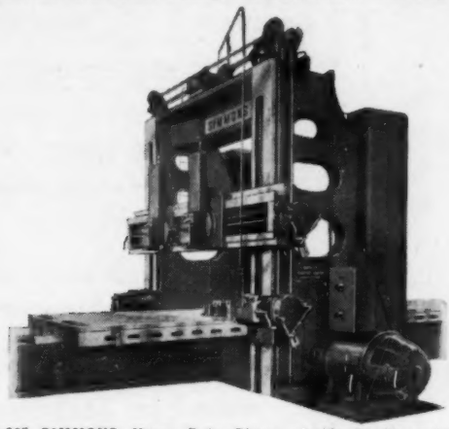
48"x48"x32' G.A. Gray Spiral Geared, 4 heads, 230V DC
48"x48"x24' N-B-P, 3 heads, 230 V DC
48"x48"x18' Detrick & Harvey Heavy, 4 heads, 230 V DC
42"x42"x12' N-B-P, 4 heads, 230 V DC
36"x36"x14' G.A. Gray, 3-speeds, A.C. or D.C.
No. 3 Hilles & Jones 30'x1½" Plate Planer, 10 pneumatic jacks, AC or DC



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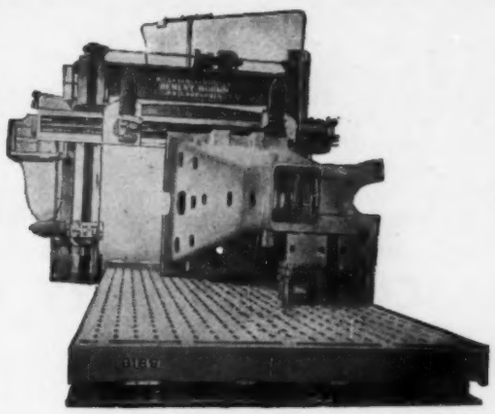

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GRINDER: #91A Covel Tool & Cutter
GRINDER: Thompson Hyd. Surface 6"x18" (2)
GRINDER: Mattison Surface Hyd. 14"x16"x60"
GRINDER: #2B Brown & Sharpe, #3B Reid
GRINDER: #5 Brown & Sharpe Surface 8"x24"
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MILLER: #3V Van Norman Vertical (2)
MILLER: #3B Milwaukee Plain, M.D.
MILLER: #3H, #3KM, Milwaukee Vert., Dial Type
MILLER: #1H-18 Milwaukee Mfg. (2)
MILLER: #2 Cincinnati H.S. Dial Type Plain
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MILLER: U.S. Multi-Miller MM-1-16
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SAWS: Marvel #6A, #9A, Auto. Feed Track
SHAPER: Atlas 7", M.D.
SHAPER: 12", 16", 21" Gould & Eberhardt
THREAD GRINDER: Excello #31
THREAD MILLER: Pratt & Whitney 4½"x12"
TURRET LATHES: Gisholt #3 and #4, bar feed
TURRET LATHE: #4 Midland, bar, threading
TURRET LATHE: #7 Bardons & Oliver, 3" cap.
TURRET LATHE: Gisholt #1L Air Cylinder
TURRET LATHE: Warner & Swasey #1, bar
VERTICAL SHAPER: 6" Pratt & Whitney, M.D.

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Cam making machine, New Or Used in good condition. Give full particulars, preferably Rowbottom make.

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Ferracute—No. C92 External Notching

BROWNING MFG. COMPANY, INC.
Maysville, Kentucky

WANTED
TURRET LATHE

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Swing over carriages	32½"	Driving motor—30 HP. 230 volts 1150 RPM	
Distance between centers	41'	Carriage motors—3 HP. 230 volts 1150 RPM	
Hole through spindle	2½"		
Speeds in head	18	Weight (Approx.)	45,000#

For Full Details

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HASCO MACHINERY COMPANY
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Bigelow 3-3486-7-8

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(Continued from page 230)

TOOL DESIGNER—Chattanooga area. Should have minimum of five years experience with single and multiple spindle screw machine tools. Some jig and fixture experience also desirable. Write full details of qualifications. Enclose photo. P-4429, American Machinist.

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EXECUTIVE ENGINEER experienced in supervising and coordinating all phases of manufacturing engineering including product design, methods, tooling, inspection, production control and industrial engineering for cost control. Twenty years with business machine, radio and industrial instrument manufacturers in Michigan, New Jersey, Pennsylvania and California. PW-4568, American Machinist.

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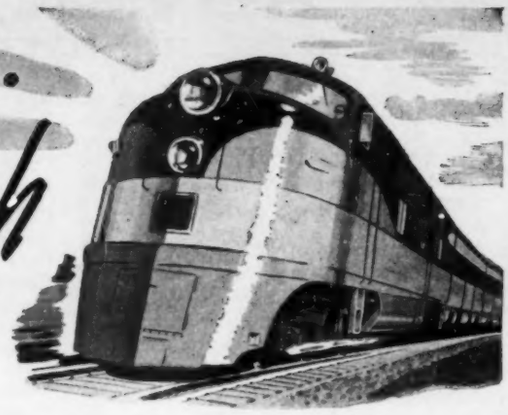
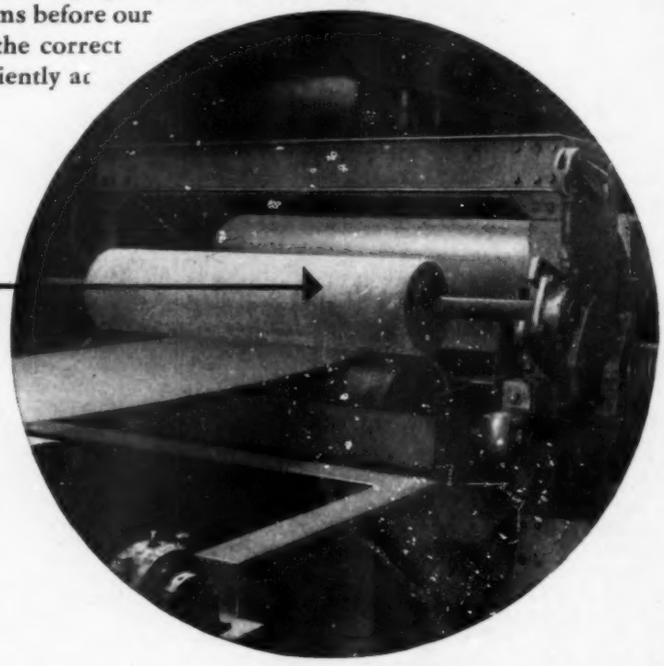


HERE'S WHAT HAPPENED:—Today's streamlined trains need big tonnages of high finished metal. One of the nation's leading strip producers ran into trouble with his brushes—brushes which burnish strip rolling, under high pressure, at 40 miles per hour. Like many other industrialists, he put his problems before our skilled brush engineers. Pittsburgh selected the correct perfect balanced brush that would work efficiently at the required speed.



This is the Pittsburgh brush that did the job!

The brush had to be stiff enough and tough enough to resist abrasion; yet soft enough to improve the surface texture. Thus another industrial brush problem was solved by Pittsburgh! You too, can always depend on Pittsburgh to solve your brush problems. The efficiency and performance of Pittsburgh Power-Driven Brushes are tested and proved day after day by strip producers all over the country.

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GLASS	AUTOMOBILE	TIRE & RETREADING
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PLASTICS	PAPER	& REPAIRING

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Use only Power-Driven Brushes By Pittsburgh—it pays

You can depend on Brushes by Pittsburgh to meet your particular finishing requirements. Perfect balance, top performance, enduring economy and a minimum of lost time in changeovers–Pittsburgh Power-Driven Brushes are specifically engineered to do your job right.

FREE!

Steel rule and depth gauge, 6", complete with pocket clip, and atttractive leather case. Yours for the asking . . . write Pittsburgh Plate Glass Company, Dept. W-3, Baltimore 29, Md.

Power Driven BRUSHES

BRUSHES · PAINT · GLASS · CHEMICALS · PLASTICS

PITTSBURGH PLATE GLASS COMPANY

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Before you buy any screw machine

"Seeing is believing" has been a basic American philosophy for centuries. Most people didn't believe men could fly until the Wright brothers showed them. People questioned whether you could successfully combine sound with motion pictures until they saw their first talkie. Thirty years ago machine tool men wondered if our present high speed tools were practical. Today some feel the same way about carbides.

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Brand new standards of speed and economy will become common sooner than you think.

Will this threaten your machine investment?

And do you know that *New Britain makes the only automatic screw machines originally designed from the ground up with the power, speed, weight and rigidity to get the full benefit with carbides?*

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Write for Descriptive Literature

KEY TO CARBIDES:

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40 h.p. practical. Higher power rating under development.

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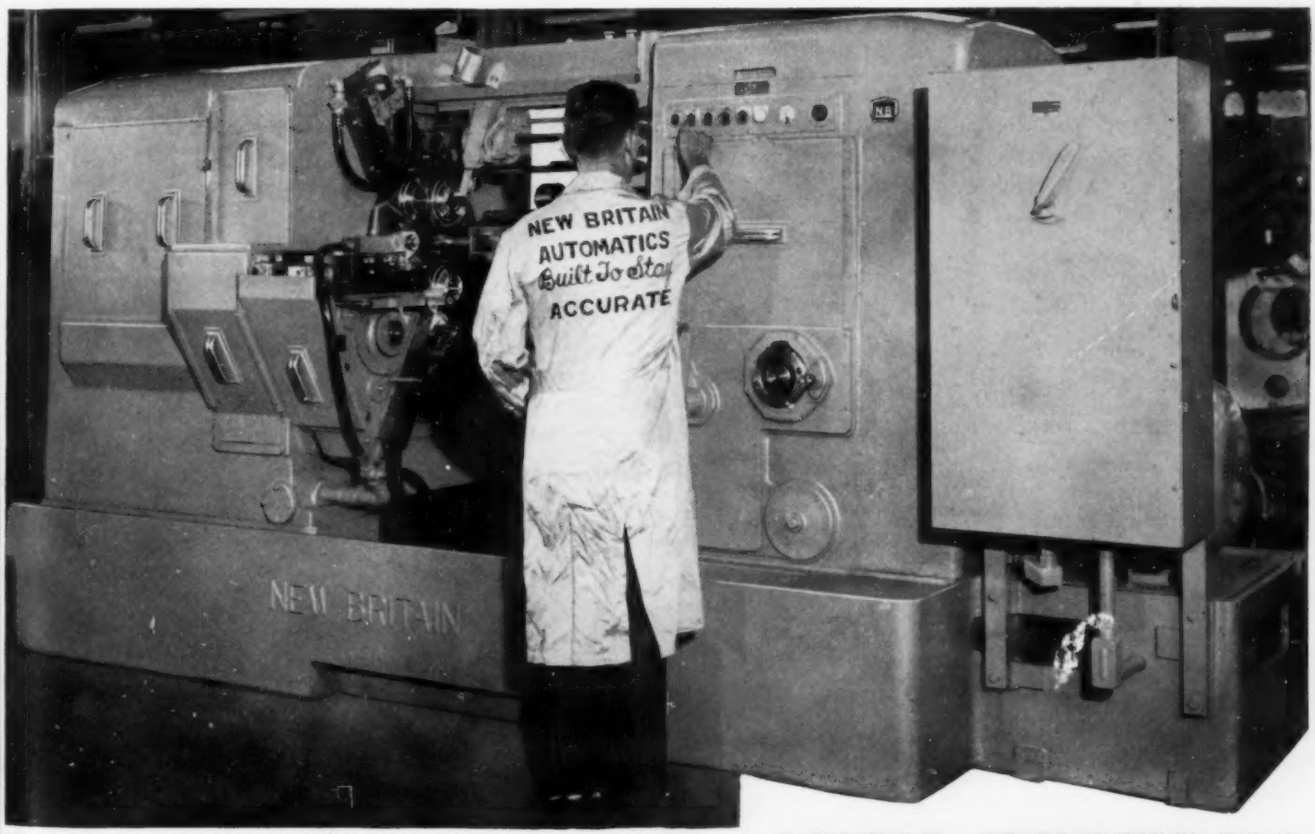
RIGIDITY:

Weights 16,000 lbs. (Model 601) to 23,000 lbs. (Model 602.) Direct camming eliminates deflection in all five heavy forming slides and main tool slide.



THIS ENTIRELY NEW LINE OF AUTOMATICS gives you full screw machine capacities with complete range of speeds and feeds for steel, aluminum and brass. (Large capacity, Model 602, illustrated with guards removed.)

New Britain Automatics Cost Less Per Finished Piece

448HKI

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NEW BRITAIN
Automatics

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NEW BRITAIN-GRIDLEY MACHINE DIVISION
NEW BRITAIN, CONNECTICUT

Looking for a steel that is

Tough and Hard

yet easy to machine?

THESE are the remarkable properties of 52100 high carbon-chrome steel—as made by The Timken Roller Bearing Company's Steel and Tube Division.

52100 has high tensile strength and high fatigue strength. It has extreme hardenability throughout its cross-section and can be oil quenched to a maximum hardness of 65/66-Rockwell C. Yet despite its hardness, it has excellent machinability as a result of spheroidized annealing in the world's largest battery of controlled atmosphere furnaces.

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If you are looking for a steel that is tough and hard, yet easy to machine, our Technical Staff will be glad to give you further details about Timken 52100 steel. Write today to The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

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STEEL

and Seamless Tubes

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